

INVESTIGATION AND ANALYSIS OF ONLINE  
READING STRATEGIES

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## **CHAPTER I**

### **INTRODUCTION**

## **Introduction**

The increased use of online sources of information in schools has teachers, researchers, and other educators struggling to teach students better strategies for locating this information, as well as strategies to critically read and evaluate that which they find. In many schools today, computers are as commonplace as books as sources of information and learning, although a number of skeptics continue to doubt the effectiveness or use of computer-based media and online texts (Oppenheimer, 2003; Cuban, 2001). However, the proliferation of computers and schools' continued investments in technology secure their position in most educational institutions. Related to the field of literacy, and literacy research, there likewise exists conflicting evidence and justification for the use of computer-based texts, hypertexts, and online texts in reading education. Over the past decade, much of the work with online texts has either argued for the possibilities and potentials afforded by these new mediums, compared the new medium (computers) to the old (print texts), or attempted to justify a new and radical approach to teaching literacy.

The differences between print and online texts are numerous and distinct. While print texts are often linear, and read through in a standard left-to-right orientation, hypertexts are often non-linear or multi-linear, and do not possess a front from which to begin or a back at which to end. While the reading path in a print text is often fixed and predictable, the path in a hypertext is random and unpredictable. Little opportunity exists for the reader to truly interact with a print text, while hypertexts offer multiple areas of interactivity. The information within a given print text is contained, standardized, and usually verified, as opposed to a hypertext which is often just the opposite –

unconstrained, multiplying, and occasionally a source of misinformation. Therefore it is logical to understand how the earliest research compared these to determine which allowed readers to gain more information. While few researchers are seeking to determine the relative strengths and weaknesses of each medium, still the basic questions of which affords greater gains for the reader is unanswered.

Learning from text is vastly different from just a few years ago. Alexander and Jetton (2000) suggest that the level of information available makes it increasingly difficult to discern relevant from irrelevant information. Classroom research with students has shown that the reader's attention is drawn to tangential information (Garner, Gillingham, & White, 1989; and Wade, 1992, as cited in Alexander and Jetton 2000). In the report *Reading for Understanding: Toward an R & D program in Reading Comprehension*, published by the RAND Reading Study Group for the Office of Education Research and Improvement, Snow (2002) concluded that new technologies, such as the Internet "make large demands on individuals' literacy skills; in some cases, this new technology requires readers to have novel literacy skills, and little is known about how to analyze or teach those skills" (p. 26). The evolving nature of literacy, brought about by continual technological change, has left literacy researchers searching for both theories and practices which address the complexities of learning to read on and with the Internet. Kress (2003) argues that it is no longer possible to think about literacy isolated from the social, technological, and economic factors of our world. Leu (2002) agrees that while literacy has always been linked to technological forces, never before have educators seen the number of envisionments of literacy developed in such a short

period of time. The New London Group's address of multi-literacies situates these changes in literacy within these multiple factors (Cope & Kalantzis, 2000).

As texts have shifted from pages to screen, researchers (Reinking, 1998; Leu, 2000; Mayer, 1997; Kamil & Lane, 1998; Foltz, 1996; McEneaney, 2003) have questioned the ability of pre-existing models and conceptualizations of reading and writing to apply to a radically new and interactive electronic medium. Can the skill sets, strategies, and practices which have been validated and used successfully with print texts be modified for use in online environments with online texts, or does the nature of the new medium require a dramatic reconceptualization of literate activities and literate practices to define reading success? Decades of research in reading strategy use, reading comprehension, metacognition, and hypertext can inform current research and offer some direction in adapting theory and practice to new literacy environments.

There is still debate on whether the findings in one medium can even be compared to another medium. Is reading print text the same as reading online text? Isn't reading reading? Or is the environment so vastly different, and factors such as motivation, interest, and skill so intertwined that any comparison between paper and screen is faulty? Some researchers, such as Mayer (1997), warn against transferring or generalizing findings from one medium to another. Other researchers, such as Leu, Kinzer, Corio, & Cammack (2004), believe that the differences between the print and online environments are so great that they cannot be compared well, with the newer technologies requiring new conceptualizations of both literacy and literate practices. Leu (1997) characterizes literacy as deictic, while Reinking (1998) situates literacy within a "post-typographic" world view. While Leu's characterization focuses on the rapid and continual change that

exists because of the ever-increasing pace of information and communication technologies, Reinking (1998) recognizes that these technologies are already dissolving the power of print, and revolutionizing the ways that literacy is practiced, recognized, and defined. In light of these changes in literacy, the significance for schooling and education cannot be understated. A shift from page to screen yields a number of obstacles and opportunities for teaching and learning in an environment of technological change and rapid acceleration of information. Leu (2000) suggests that these changes will likely require greater levels of strategic knowledge, and perhaps even different forms of knowledge in order to successfully navigate the increasing amounts of information available in an online global environment. Despite these claims, and still allowing for their sometimes competing arguments, many of the theories and practices which have been used in print reading can be applied and adapted for their use in online environments. Research in reading comprehension, reading strategy use, metacognition, and hypertext are indeed useful when considering the skills and strategies which may be needed as students read online texts.

Reading online has become more common for students in the past few years. Young people often turn to the Internet before books when gathering information, read online for pleasure and learning, and use online materials to complete school assignments. In the *Teens and Technology* (2005) survey, a part of the Pew Internet and American Life Project, researchers found that 21 million (87%) teens, aged 12-17, report using the Internet, up from 17 million (73%) in 2000. More than half of the students who go online reported that they go online on a daily basis. Schools are also popular places to go online, with 78% of the students reporting that they use the Internet in school

classrooms and libraries, up from 64% in 2000. These numbers suggest an increasing pervasiveness of the Internet and more online activity in the lives of young people in the past five years.

From multiple and varied perspectives, researchers in semiotics, hypertext, educational technology, instructional design, and literacy are all seeking to discover how the visual and verbal are working together in the forms of online texts (Chen & Rada, 1996; Kress, 2003; Bolter, 1998; Lemke, 1998; Mayer & Moreno, 1998; Mayer, 1997; Kamil & Lane, 1998; Leu, Kinzer, Corio, & Cammack, 2004). All of these fields wish to understand how these online texts are reshaping instructional practices and how students use strategies to identify necessary elements. Researchers from this range of disciplines are invested in knowing how technology is changing our views of written communication, the concept of text, and what it means to be a literate individual in the 21<sup>st</sup> century. What has failed to happen is a separation from the ideological base defining each field, and a willingness to use theories and methodologies from the others.

Therefore, the basic research question “What strategies do students use while reading online?” may not seem entirely novel. Two groups, reading researchers and usability experts, have both attempted to study how people read online (Nielsen, 2005a; Nielsen 2005b; Hill & Hannafin, 1997; Potelle & Rouet, 2003; Nielsen, 1997; McNamara & Shapiro, 2005; Kymes, 2005; Salmeron, Cañas, Kintsch, & Fajardo, 2005; Eveland & Dunwoody, 2000; Burke, 2000). Reading researchers have focused primarily on the texts themselves and have devoted much attention to hypertexts; yet, most of the research has been conducted with texts which are contrived or highly controlled for the purposes of the investigation. Usability studies have focused on the factors which affect readability,

such as spatial placement, size and color of text, and effective combinations of text and graphic materials. However, in most of these studies, those from the reading perspective and those from the usability researchers, the question of skill and strategy does not play an important role. The only researcher from the usability side to mention strategy is Nielsen (1997) who questions how readers read on the web, and then answers offhandedly - they don't.

Several researchers have attempted to begin to answer many of the questions that arise from a realization that the research on print texts may or may not be sufficient to address the issues involved with online texts. However, Alexander and Jetton (2000) believe that the current knowledge of learning strategies in online environments is too limited to guide practice. What students of varying levels of knowledge, interests, and goals *actually do* while reading online or which skills and strategies they *do and should employ* are still not known (Alexander & Jetton, 2000, p.295-6.) Kamil and Lane (1998) argue that while the pace of technology accelerates, literacy researchers have been silent “on the sidelines” of this area of research (p.328). These researchers believe that while much is known about the strategies readers employ with print texts, a systematic analysis of strategy use with online texts is missing from the knowledge base. Kamil and Lane (1998) state that “until we have data about whether or not students can and do utilize hypertext in productive ways, we will have no way of grounding theory” (p.333). Additionally, educators have a responsibility to teach students to read the types of materials they will encounter (Kamil, Intrator, & Kim 2000). Kress (2003) recognizes that the types of literacy practices and behaviors typically taught in schools have little resemblance to the kinds of literate behaviors in which students engage outside of the

classroom. He states that the new literacy skills required by students are guided by multi-modal assimilation and a “near instant response” (p.174). While educators may feel the need to teach students in the way of “sustained, concentrated attention over an extended period of time,” Kress (2003) argues that this cannot be the only form of reading that is taught, and it should not be the only form of reading that defines the activity for future generations.

### **Problem Statement**

Students and teachers alike turn to the Internet for classroom assignments, study purposes, and information acquisition. However, teachers may falsely assume that because students know how to navigate the Internet – that is they know how to point, click, and type – they are also able to comprehend and analyze the information they locate. Burke (2002) believes this is a common misconception of both students and adults. Although we know how to use hypertext and navigate through pages online, McEneaney (2003) reminds that it is not at all clear how the theories and practices of literacy, learning, and instruction are affected by the consequences of online texts. In order to be able to comprehend and analyze information, reading research and reading theories indicate that students must be able to strategically process the information they read. The Internet requires this of students, as well as additional skill in their search strategies for information location. Researchers and educators are in need of additional research in this area to guide and establish classroom practice in teaching students to



effectively search for and read information from the Internet (Alexander & Jetton, 2000; Kamil & Lane, 1998; Kamil, Intrator, & Kim, 2000; McEneaney, 2002; 2003).

At present, it is critical for researchers to determine if the same sets of strategies used with traditional print texts apply to online environments, or if there are new strategies and new skill sets used by readers when they interact with an online text. Initially, it appears that many of the skills and strategies used in print environments indeed do apply to online texts. While the majority of reader behaviors are similar, minor differences do exist. Whether these differences are minimal or significant remains an unanswered question for researchers in the field of online reading comprehension. What role strategic knowledge plays in the online environment, and which reading strategies are most beneficial likewise remain elusive to reading researchers.

### **Purpose of the Study**

The purpose of this study is to identify, analyze, and categorize the strategies used by high school students while searching for and reading information in online texts. It seeks to determine if the strategies used by students when reading online texts are similar to those used in print or if they cannot be categorized according to the traditional skills validated by reading research. McEneaney (2002) suggests that it may be most beneficial for researchers to step back from the navigational aspects of hypertext and instead focus on the “broader dispositions and foundational metacognitive skills that people bring to reading and learning in hypertext”(p.6) in order to truly understand the particulars of reading in this environment.

## **Research Questions**

After a thorough review of the literature, several interrelated questions guided the structure and procedures of this research project. Five questions which could be measured by quantitative means and one question requiring qualitative analysis were formulated.

### **Quantitative:**

- 1) What strategies do students report using when reading print material?
- 2) What strategies do students report using when reading online?
- 3) Does greater strategy use exist in one format or the other?
- 4) Does online strategy use depend on familiarity with the Internet?
- 5) Does online strategy use depend on reading comprehension ability?

### **Qualitative:**

- 6) What strategies do students actually employ when they are online searching for information?

## **Framework**

A number of researchers have attempted to identify strategies which guide individuals in their reading of printed texts (Pressley & Afflerbach, 1995; Paris & Winograd, 1990; Garner, 1987; Mokhtari & Reichard, 2002; Wade, Trathen, & Shaw, 1990; Pintrich, Wolters, & Baxter, 2000). Many other researchers are focused on how individuals read texts online (Hill & Hannafin, 1997; Potelle & Rouet, 2003; McNamara

& Shapiro, 2005; Rouet, 2003; McEneaney, 2003; Salmeron, Cañas, Kintsch, & Fajardo, 2005; Chen & Rada, 1996; Burke, 2000).

Skill and strategy are two hallmarks of engaged, effective readers. When readers remain focused on both their task and the text, greater recall and comprehension are more likely to occur. The most comprehensive research on reading strategy use was completed by Pressley and Afflerbach (1995). In *Verbal Protocols of Reading*, they determined that skilled readers possessed a number of strategies which allowed them to interact with texts and interrogate texts before, during, and after reading. In this work, Pressley and Afflerbach analyzed 38 primary research studies of reading strategy use in which the methodology employed think-aloud protocols to determine which strategies were characteristic of skilled, engaged, and responsive readers. Through their analysis of these studies, Pressley and Afflerbach (1995) identified thirty-two strategies, some with multiple components, which identify the behaviors that appear to contribute to reading success and characterize effective reading. These strategies have been divided into those used before, during, and after a specific reading activity. The studies used to compile this list of strategies varied considerably with regard to their texts, tasks, and the skill and maturity of the readers involved. Most of the studies represented were qualitative in nature, while a few were quantitative, and the studies emerged from a variety of academic disciplines. Pressley and Afflerbach (1995) note that most often the impetus for the research was a desire to identify the strategies used by readers to accomplish a particular goal designed by the researcher (p.17). For this particular study, the fourteen strategies used during reading will be treated as a priori categories of strategic performance and will

be used to classify the actions and methods of understanding used by students as they read texts online.

### **Methodology**

One of the most widely used approaches to study the nature of strategy implementation during reading is the think-aloud, or verbal protocol. The classic approach to using this methodology is detailed by Ericsson and Simon (1993). Pressley and Afflerbach (1995) later reviewed how this protocol has been applied to reading research, how future studies should be designed, and which limitations should be addressed by future researchers. The think-aloud methodology asks the researcher to interpret the verbal responses, understand the language and terms used by the participants, and code or categorize the responses according to the types of strategies used by the reader. The statements and thoughts of the participants are analyzed to determine how they fit into the pre-established categories and frames identified by existing reading research. Ericsson and Simon (1993) note that in most instances of protocol analysis, the role of the coder is to map the verbal reports onto concepts identified a priori (p.6). The underlying desire of the researcher is to objectively identify how greater, or more in-depth, use of strategy contributes to the reader's success and comprehension. However, this could also be considered an interpretive inquiry as the research seeks to understand the complicated act of reading, sense making, and strategy use as it applies to the online environment. Because researchers know that there are a number of influences on the success of any reading activity, including age, ability,

background knowledge, interest, and motivation, the think-aloud gives the reader an opportunity to demonstrate how all of these factors affect the thoughts and feelings of the reader as he/she is engaged in the actual task of reading. The think-aloud methodology allows for the reader to demonstrate that reading is indeed an unpredictable event, where neither the teacher nor the researcher can control all of the variables that may affect success, satisfaction, and comprehension.

Afflerbach's (2000) analysis of the think-aloud methodology situates verbal protocol analysis as both an effective and usable form of data collection for researchers wishing to capture information about a reader's cognitive, affective, and social dimensions of reading. This type of reporting provides information on the range of processes which are related to reading, as well as an examination of the variables at work in the reading process, including the text, task, and reader ability. Because protocol analysis can help "better understand the diverse strategies and processes" used by readers, as well as reveal "considerable individual differences in how people read," Afflerbach calls for additional research which utilizes this particular methodology (2000, p.173). While acknowledging the tradition of its use with print texts, Afflerbach realizes that this type of methodology could be useful for describing the benefits and challenges of searching for information and interacting with hypertext as students and teachers shift attention to these "new" skills of literate individuals (p.174).

Van Someren, Barnard, and Sandberg (1994) suggest that the think-aloud be combined with other research strategies to indicate the generalizability of the results. A number of assessment instruments have been developed to determine the utilization and reliance on specific strategies used by individuals in reading activities. Several benefits of

using assessment and self-report instruments include the ability to administer them to a large number of subjects or participants, the ability to score them quickly and accurately, and an ability to compare the use of strategy to other measurable behaviors such as reading time/speed, comprehension, and general reading ability. Likewise, scores obtained from these questionnaires and self-report measures can be compared across subjects or participants within the population to highlight a range of capabilities and varied situations for strategy implementation. In addition to the questionnaires and self-report data, there is a need to compare the results of the think-alouds to the formal measures of reading ability (assessed through standardized instruments) and to measures of comprehension and recall (Afflerbach, 2000). Pressley and Afflerbach (1995) call for greater validation of the think-aloud reports through their relation to objective measures of performance, and state this criteria as key to the future role of the methodology in reading research. The combination of these multiple measures will work together to alleviate inconsistencies caused by either a highly-contextualized account of strategy use or a highly-abstracted generalization of strategy use.

### **Significance**

This study seeks to fill a gap in the existing literature which classifies and analyzes the types of strategies students use while searching for information and reading online. While many studies have been conducted with college students and other adults, very few focus on students in K-12 settings. If researchers adopt a position that field-research can improve classroom practices, this study can be valuable in its discussion of

strategy use, and considerations for teaching practices which would assist students in making more efficient and effective use of reading strategies when using online texts.

### **Theoretical Framework**

One of the most commonly accepted models of text comprehension was introduced by van Dijk and Kintsch (1978; 1983) and Kintsch (1988; 2004). The construction-integration model allows for text to be processed at two levels, the textbase, which is the semantic information presented in the text, as well as the situation model, which consists of the information presented by the text which is integrated with the reader's background knowledge (Kintsch, 2004). Therefore, while many readers will form a similar textbase from reading the same information, the situational models constructed by those same readers will vary greatly. Kintsch (2004) notes that in order for information to be used at a later date, a reader must actively link new information to existing information, a process which requires "strategic action and effort on the part of the reader/learner" (p.1275).

In much of the research on mental models and knowledge construction and integration, expert readers, or highly skilled content specialists, have been used to verify theory. Ericsson & Kintsch (1995) proposed that short-term or immediate memory is very limited, while long-term working memory is restricted to familiar knowledge domains and tasks which are familiar, even repetitive to the point of automaticity in experts. Kintsch (2004) notes that students are not experts, either in specific knowledge domains or in reading, but are learning how to be proficient in reading skill as they master a knowledge domain. Because pre-existing knowledge structures and skill allow experts to

proceed through text with a level of automaticity, it is worthwhile to realize the level of active problem solving, knowledge construction, self-explanation, and monitoring in which students must engage in order to learn from the text (Kintsch, 2004).

It is upon these four behaviors – active problem solving, knowledge construction, self-explanation, and monitoring – that much of the research on reading skill and strategy has been formulated. Côté & Goldman (2004) researched how children made representations from informational texts and categorized the students based on their behaviors, skills, and statements made while reading. Guiding this work are the principles about text information construction by Kintsch (1988) and van Dijk & Kintsch (1983) which assumes that readers construct different levels of text representation, that a reader's working (or short-term) memory is limited, and that information from the text can be integrated into long-term memory when both the text information and the framework from long-term memory are in working memory at the same time (Côté & Goldman, 2004).

Many of these terms are borrowed from the field of psychology, specifically cognitive processing, where Ericsson & Simon (1993) detailed how the contents of short-term memory can be elicited from research participants and recorded as data to be used for researcher information about how knowledge is processed and used in a variety of situations. It is assumed by Ericsson & Simon (1993) that information can be stored in a variety of memories which have differing capacities and durations (p.11). The method of eliciting information– the think-aloud protocol – allows the researcher to access the contents of short-term memory as the participant is engaged in a task which requires the behaviors of problem solving, knowledge construction, self-explanation, and monitoring.



Participants are asked to simply give voice to the thoughts which enter their consciousness, refraining from explanations, elaborations, or classifications of those thoughts. As long as the reporting is concurrent with the task, it is believed that the statements are an accurate representation of the thought which is present in short-term or working memory, and gives detailed information regarding the strategies and models the participant is using and constructing in order to cognitively process and understand the information. Ericsson and Simon summarize that if the participant verbalizes only that information which enters their attention as part of the task completion, “the sequence of thoughts is not changed by the added instruction to think-aloud” (p.xiii). When the reports are given retrospectively, or when the subject is allowed to explain the thought or classify the nature of the thoughts, Ericsson & Simon (1993) claim that the statements cannot be considered “hard data,” equivalent to other forms of observable behaviors, because the nature of the thought is changed as additional information and thoughts are accessed in order to create these auxiliary descriptions. The request by the researcher to explain the nature of the thought, rather than simply report the thoughts, “very likely changes the structure of the thought processes” (p.81). It is therefore most desirable for the participant to give voice to thoughts while concurrently involved in a task. In this research project, the think-aloud activity allows the students to explain their use of reading strategies while reading online.

## **CHAPTER II**

### **REVIEW OF THE LITERATURE**

## **Introduction**

Many researchers have attempted to answer a number of research questions regarding the use of print texts and hypertexts and the roles of skill and metacognition in approaching the task. While this research is highly valuable to inform this particular study, considerable room is left for additional research which attempts to systematically analyze the relationship between print reading strategies and online reading strategies and which uses a similar framework to compare these two. The role of skill and strategy has long been integral to the reading process, with a number of researches confirming that readers who are more skilled in their approach to reading and who utilize a wider range of strategies while interacting with the text are more successful in their reading experience (Pressley, El-Kinary, & Brown, 1992; Duke & Pearson, 2002; Pearson, Roehler, Dole, & Duffy, 1992; Garner, 1987; Garner, 1992; Wilhelm, 2001). Similarly, the role of metacognition and the related component of self-regulation allow readers to be more successful when they are aware of comprehension break-downs while reading and systematically apply fix-up strategies to improve their understanding of the text (Garner, 1987; Collins, Dickson, Simmons, & Kameenui, n.d.).

In the following analysis of the existing research which relates to online reading, these components of skill, strategy, metacognition, and self-regulation are analyzed within the contexts of both print reading and hypertext reading. Early research on computer texts was conducted in the late 1980s and early 1990s, prior to the advent of the World Wide Web as we know it today. Screen resolution was often poor, color monitors were not widely available, and processors were small and slow. With the advent of the World Wide Web, hypertext research flourished and the links and nodes which defined

the “new” medium was compared to the natural ways in which the human brain connects, groups, and accesses information.

Most of the hypertext studies were conducted in the early to mid 1990s, and while yielding significant and valid information, are also used cautiously in their application to this particular study. Because the majority of the hypertext research was conducted with highly controlled texts, it may have limited transferability to modern contexts in which students simply go online to locate information which has not been structured or manipulated by a researcher. Nonetheless, a careful review of this research can be constructed which extracts the most salient information and applies it carefully to the situations in which most readers find themselves today.

### **The Role of Skill and Strategy Use**

When researchers talk of strategy use, the terms strategy and skill are often used interchangeably in the literature. However, Alexander & Jetton (2000) differentiate skill from strategy through a discussion of automaticity and intentionality. They claim that any behavior in which readers engage almost effortlessly or without the purposeful invocation of that behavior should be classified as a skill. They compare skills to habits or responses which have been developed to a level of automaticity, and which are essentially “academic habits” (p.295) in which good readers engage. In contrast, strategies are those behaviors which the reader must summon in order to proceed through a text and engage in meaning production. Strategy is effortful, as it requires the reader to allocate energy and resources to engage in strategy use (Garner, 1987). Alexander, Graham, & Harris (1998)

note that the six attributes which distinguish strategy can be characterized as procedural, purposeful, effortful, willful, essential, and facilitative. All of these characterizations of behavior remove strategy from the level of automatic habit and indicate that the reader must cognitively determine that some other type of processing is required to complete the reading task.

The question of transfer is one which often arises. If readers are skilled and strategic readers of print texts, will they be able to transfer those skills to a new environment? McNamara & Shapiro (2005) conclude that “the complexities of learning from linear text and hypertext are similar to those associated with general knowledge and skill acquisition” (p.21). Bland (1995) found that adult users with high levels of computer skill were indeed able to transfer strategies that were successful to them in print texts to online texts. These experienced users also invented new strategies to assist them in managing and integrating information. Additionally, the users were able to read more online and understand more of what they read when they experienced greater control of the online document. Some reading strategies seem to apply to both print and online texts, while others may depend on the medium. Elshair (2002) suggests research focus on both print texts and web texts concurrently, as the strategies can be integrated and teased apart of variations in strategy.

In their analysis of hypertext reading, Anderson-Inman & Horney (1994) identified six possible strategies used by students. These included skimming, checking, reading, responding, studying, and reviewing. Britt and Gabrys (2001) identified skills required for success online, which they believe are inherent to multiple fields and disciplines, and which they term “advanced literacy skills” (p.74). These include

sourcing, corroborating, integrating. Integration allows the reader to connect new information to existing knowledge structures, building links between the old and the new. In electronic environments, integration is more difficult because a non-linear presentation loses the coherence usually assumed in print texts, and because the number of texts to integrate is increased as the quality is inconsistent. Much earlier, Jonassen (1988) asserted that this problem of information integration could prevent hypertext from being used to its fullest potential for teaching and learning. Corroborating requires the reader to evaluate the quality and accuracy of the information by cross-checking it against other sources. McNamara & Shapiro (2005) call this skill of corroboration 'cohesion' and define it as the ability to make connections between multiple electronic texts. When readers are able to employ this strategy, they are able to connect the discrete pieces of information within their mental models of the text (Shapiro & Niederhauser, 2003; McNamara & Shapiro, 2005). Sourcing may be the most difficult of the skills, as it requires the reader to evaluate the credibility and trustworthiness of the information located.

Because of the additional requirements of searching, navigating, following links, and situating oneself in cyberspace, many researchers have suggested that the skills traditionally associated with reading comprehension using print text become even more important when reading online texts (Goldman, 1996; Leu & Reinking, 1996; Foltz, 1996; Rouet., Levonen, Dillon, & Spiro, 1996). Foltz (1996) focuses on the background knowledge the reader brings to the hypertext, noting that those readers who bring little background knowledge to the reading task may experience significant disorientation and frustration, because the level of controlled processing they assert is divided between the

need to navigate the system and comprehend the text. Because background knowledge can form a conceptual structure into which readers can assimilate new information, higher levels of this knowledge may contribute to greater success. Due to the flexibility of hypertexts, or because the information is not presented in a traditional linear path, readers with little background knowledge may be unable to attach the new information to a conceptual frame while additionally struggling with how to navigate through the information presented. In contrast, readers with higher levels of background knowledge may be able to compensate for less order in the presentation of information because they possess the conceptual structure of the topic and can “exploit some of the less coherent links in the hypertext” (p.128). Therefore, Foltz (1996) argues that a knowledgeable reader is better able to exploit the less coherent links within the hypertext and maintain higher levels of overall coherence within the text. Using research from Goldman and Saul (cited in Foltz, 1996) Foltz believes that as in print environments, readers in electronic environments must draw on a number of strategies to maintain coherence throughout the text. Foltz calls for a better understanding of the constraints of the reader and the constraints of the text so that weaknesses in each can be supported by the other (p.131).

The availability of online resources and assistive tools has also been a feature of investigation by reading strategy researchers. In a recent study with college-aged ESL students, Poole and Mokhtari (in press) found that students used more strategies with online texts than print texts, often because these were more readily accessible online, and students also used a greater number of strategies simultaneously when online. The students were more likely to seek definitions, pronunciations, and clarification of terms and concepts while reading online, due to the ease of locating and using the tools that

provide the information. Indeed, it is much easier to click a link within the text rather than locate an external tool such as a dictionary or other resource to provide assistance to the reader.

Much of the research with electronic texts in the past few years has focused on how readers interact with the text, and which strategies are employed by readers to be successful with these texts. McEneaney (2003) reported difficulties for readers in hypertext, although the study did not reveal why these difficulties existed. Because familiarity with technology did not significantly correlate with hypertext scores, difficulty could not be attributed to participants' frequency of using the Internet. McEneaney attributes the inconsistency to differences in reading online which do not have parallels in print material. Citing Wenger and Payne (1996), McEneaney argues that hypertext reading requires a different set of skills than does reading in traditional print environments. Goldman (1996) argues that most existing comprehension theories assume linear texts and that these theories may prove to be insufficient for explaining the processes and skills required for success in electronic environments. Because the electronic environment requires search and retrieval skills unmatched in print texts, "the skills of monitoring and evaluating comprehension become more important than in a linear text environment" (p.34).

Any discussion of electronic texts, and their potential to afford readers with supports for constructing meaning, improving comprehension, and affecting learning would be incomplete without an analysis of the decades of work by David Reinking. His body of experimental research has attempted to determine under what conditions electronic texts can assist the reader in becoming more proficient. Reinking's early work



in the late 1980s and early 1990s with electronic texts attempted to prove that reading skill and comprehension could benefit from these digital presentations of text.

A number of themes synthesized from Reinking's work can be identified as qualities of electronic texts which scaffold the reader and support the development of skill, comprehension, and metacognition, and move the reader toward new conceptualizations of literacy. First, electronic texts have the ability to combine visual and verbal messages in unique ways. Second, electronic texts can create true interaction between the reader and the text. Third, electronic texts are useful in not only accomplishing traditional literacy goals, but they are beginning to advance new literacy agendas. Reinking's experimental research has also focused on the ability for computer-mediated texts to improve the skills of the reader and result in greater comprehension of a text. The research by Reinking and his associates determined that when the computer controlled textual presentations or made mandatory assistive features available to the reader, significant gains in comprehension and vocabulary learning resulted (Reinking, Hayes, & McEneaney, 1988; Reinking & Rickman, 1990; Reinking & Schreiner, 1985). While strategy use is generally considered to be only part of comprehension and metacognitive research, Reinking's body of research with electronic texts indicates that students may need to be somewhat less proficient in their use of extraneous strategy and more reliant on the assistive features provided by the text itself. However, it is critical to realize that successful manipulation and exploitation of the assistance provided by the electronic text comprises another set of strategies which may be similar or entirely different from the strategies used in print-based environments. Leu and Reinking (1996) suggest that strategic knowledge may be more important in electronic environments than

print environments, because the “electronic environment requires more decisions about which sources of information to explore in order to accomplish a learning goal” (p.56).

However, the learning goal itself must be clearly identified in order for the research to have much to bear on the nature of the reading experience. Some authors (Hacker, 1998b; Pressley, 2000) have criticized research which presents texts which have been contrived or exaggerated for experimental purposes. Texts found on the web are often not controlled, and are rarely assistive in the ways researchers have demonstrated foster success with students. Hacker (1998b) fears that “much of what is known about self-regulated comprehension during typical reading does not generalize to the kinds of reading typically encountered in educational contexts” (p.175).

The skills generally observed in online studies include skimming, browsing, and selecting. While these skills may be beneficial for casual or recreational use of the Internet, they may not be sufficient for research or study purposes (Kamil & Chou, 2005), for as Jonassen (2000) notes, “browsing does not necessarily result in thinking and learning” (p.177). When the skills of browsing and navigating are practiced without intentionality or purpose, students tend to lose focus, forget the topic at hand, and move further away from the learning goal (Jonassen, 2000; Elshair, 2002). There may be relevant distinctions between browsing, navigating, and reading, and an individual moves in progression to higher levels of cognitive processing as these distinct stages are traversed. Elshair (2002) contends that browsing is an activity which often lacks purpose, while navigating allows the user to learn the structure of the site and maneuver through the space. Reading is purposeful use of meaning making strategies, where the user interacts with the text to elaborate, recall, and evaluate the information. Usability studies

have often focused on the ways that individuals interact with websites, but fail to separate reading strategies from navigational studies (Elshair, 2002). Stimson (1998) theorizes that the metacognitive skill of the reader, especially monitoring and control, determines the amount of information the reader is able to learn from the hypertext. The results of Stimson's studies show that the activation of metacognitive control can increase learning in electronic environments.

### **Metacognition in Reading Research and Internet Use**

Metacognition has been one area in which a great amount of literacy research has occurred using both print and online texts (Baker & Brown, 1984; Garner, 1982; Garner, 1987; Hill & Hannafin, 1997; Foltz, 1996; Stimson, 1998; Bendixen & Hartley, 2003; Dillon & Gabbard, 1998; Hartley, 2001; Anderson-Inman & Horney, 1994). As a term first used by Flavell (1979), metacognition referred to an individual who is conscious and aware of his or her own thinking, and is generally considered the ability to think about thinking. Paris & Winograd (1990) add the dimensions of motivation and affective characteristics to the basic awareness of cognitive states and abilities. Collins, Dickson, Simmons, & Kameenui (n.d.) summarized the research on metacognition and reading comprehension. In this synthesis of the available research, the authors found that metacognition is related to reading comprehension, and that metacognition characterizes readers who are active and more successful in their reading tasks.

In an attempt to clarify, Hacker (1998a) defines metacognition as conscious and deliberate thought that has other thought as its object (p.7). This remains a guiding

definition in the field of reading research. Because the thought is deliberate and controllable by the individual, it is also potentially reportable and accessible to other individuals, including researchers. Hacker (1998b) proposes a model of metacognition applied to reading which he calls self-regulated comprehension. This theoretical model allows the reader to achieve consistency and maintain relevance while reading, to construct the meaningful interpretations of text which are the goal of normal reading activities. It is similar to the Nelson and Narens (1990) model which recognizes the interconnectedness of cognition and metacognition, viewing them as interacting processes rather than independent parts. Hacker cautions that there are limits to the amount of information readers can monitor and control, that there is a level of constraint “because readers cannot know the text but through their own knowing.” Additionally, Hacker (1998b) calls for more research in the fields of reading and metacognition, for what we know to this point may be confined to situations which have been artificially created for experimental research purposes, and may not “generalize to the kinds of reading typically encountered in educational contexts” (p.175).

A number of attitudinal, motivational, and epistemological traits have been used to explain the reading behaviors and metacognitive controls at work when individuals read online texts or hypertexts. McEneaney (2002) considers the possibility that there are fundamental behaviors, dispositions, and characteristics which lead some individuals to be more active in their engagement with hypertexts, creating their own meaning and seeking unique paths through the information, while other individuals are less active in the construction of meaning relying instead on the structure and presentation of the information. Hill & Hannafin (1997) studied the combined influences of metacognitive

ability, background knowledge, and perceptions of self-efficacy or disorientation within open-ended searches online. McNamara & Shapiro (2005) found that skilled readers are active comprehenders who employ more metacognitive strategies, understand texts better, learn more from texts, and make more inferences from texts. Stimson (1998) theorized that students who were able to metacognitively control and monitor their learning would learn more from a hypertext document. The measures of metacognitive ability were predictive of learning from hypertext but not from linear text.

### **Think aloud protocols**

Ericsson and Simon (1993) detail verbal protocols, also called a think-aloud, along with suggestions for its use in research in their work *Protocol Analysis: Verbal Reports as Data*. Throughout the twentieth century, studies in which participants were asked to think-aloud have been useful in a variety of disciplines and specialized fields, including reading comprehension, task analysis, expert studies, and a wide number of problem-solving studies. Think-aloud protocols have been used extensively in reading research to determine the role of skill and strategy and the level of metacognition of the reader (Wilhelm, 2001; Dail, 2004; Wade, Buxton, & Kelly, 1999; Afflerbach, 1990; Wade, Trathen, & Schraw, 1990).

In any think-aloud study, users are asked to simply give voice to their thoughts as the ideas are consciously perceived. Long-term memory is that which is stored and must be consciously accessed by the individual. Short-term memory is that information that passes through the individual's awareness and is not yet categorized or stored into long-term memory. These two forms of memory, working together, allow for information to be

cognitively processed. Ericsson & Simon (1993) specifically warn the researcher against requesting the participant to explain or describe their thoughts. When verbal reports are given concurrently with a task, the information reported can be considered an accurate representation of the strategies participants use and the cognitive models they construct in an attempt to understand information and proceed through the completion of a task.

The cognitive processing model proposed by Ericsson & Simon (1993) is based on the following assumptions:

1. Verbalized cognitions are states that correspond to the contents of short-term memory.
2. The information verbalized is an encoding of information in short-term memory.
3. Verbalization processes are initiated as a thought is accessible.
4. The verbalization reflects not only the content but also the structure of the thought.
5. Units of speech will correspond to integrated structures.
6. Pauses and hesitations reflect a shift in the processing of cognitive structures.

The method of eliciting verbal information as data is not without criticism (Garner 1987; Baker & Cerro, 2000). There are times when subjects are not able to give voice to their thoughts, due to limitations based on language or the limits of their cognitive processing. Additionally, many researchers feel that the added request to verbalize thoughts will interrupt the processing of the task. However, Schraw (2000) believes that these limitations can also indicate the nature of the task demands (p.311) and Winsor

(1988) argues that verbal self reports may indeed be more valid measures of processing as opposed to “outmoded psychometric tests” (p.260). While there are limitations to the amount and quality of information the participant can report, based on factors such as age, motivation, verbal ability, and level of cognitive processing, the recommendations for conducting research from Ericsson & Simon (1993) can assist the researcher in avoiding potential pitfalls in the research process, and help to ensure accuracy in the participant’s reporting and validity in the researcher’s coding of the reports. Indeed the authors recognize that although there may be some slowing of processing, the overall structure of the thought is not affected by this added burden of speaking. Additionally, while there will be differences in individual ability, Ericsson & Simon (1993) maintain that this phenomenon is consistent with the model of cognitive processing they propose, yet can be minimized with practice and warm-up activities provided by the researcher (p.250). Ericsson & Simon (1993) argue that the evidence from the repeated use of think-aloud protocols in a number of research domains indicates that verbal data can be considered highly relevant and informative concerning individuals’ cognitive processes and information construction, revealing critical information about what information is being attended to, and providing “an orderly picture of the exact way in which the tasks are being performed: the strategies employed, the inferences drawn from information, [and] the accessing of memory by recognition” (p.220).

## **CHAPTER III**

### **METHODOLOGY**



## **Introduction**

This chapter will summarize the methodological approaches and data collection procedures relevant to this particular study. These procedures were chosen as a result of the design of the study and the questions it seeks to answer. This study attempts to categorize and compare online reading strategies and print reading strategies. As a result, a framework which has served useful in print environments is used as the set of *a priori* guidelines onto which the findings will be mapped. This study will combine both quantitative and qualitative measures to ensure completeness of the data. The quantitative results, scores and figures from several questionnaires, will be used to then select individuals for qualitative analysis. Creswell (2003) classifies this type of mixed methods study as a sequential explanatory study, and describes it as:

the most straightforward of the six major mixed methods approaches. It is characterized by the collection and analysis of quantitative data followed by the collection and analysis of qualitative data. The priority typically is given to the quantitative data, and the two methods are integrated during the interpretation phase of the study. The purpose of the sequential explanatory study typically is to use qualitative results to assist in explaining and interpreting the findings of a primarily quantitative study (p.215).

Additionally, Creswell (2003) notes the simplicity of the design as its major strength, and mentions that its main weakness may be the length of time required to collect two phases of data separately.

Although some purists on both sides will decry the use of both quantitative and qualitative methodologies, this particular study is one in which the measures can be combined for greater understanding and a deeper analysis. Many authors (Creswell, 1994; 2003; Johnson & Onwuegbuzie, 2004; Onwuegbuzie & Teddlie, 2003; Tashakkori & Teddlie, 1998) have suggested that the combination of strategies within one research

project, often called a mixed methods approach, can be beneficial in a number of ways. These authors also remind researchers that while qualitative and quantitative approaches to research often originate from different theoretical paradigms or ontological and epistemological stances (particularly in the social sciences) both of the approaches to research are used to describe data or individuals, explain situations and human behavior, and provide reasonable assertions about people and their environments while minimizing error and bias (Johnson & Onwuegbuzie, 2004). Creswell (2003) claims that the mixed-method approach is beneficial because different facets of the research project are used to inform the other, allowing for a type of applied triangulation, for complimentary results to emerge, and for both contradictions in the data as well as new perspectives to surface within the analysis. Johnson & Onwuegbuzie (2004) argue that mixed methods research involves both hypothesis testing and a discovery of patterns.

Both of these research strategies have been combined in this research project in order to allow for the data to inform one another. Much of the quantitative data in the project comes from survey and questionnaire data, while the qualitative data results from verbal protocols elicited from the student participants. By combining both qualitative and quantitative research methodologies, each portion of the data can work together to more fully explain the findings. While the quantitative results from the surveys and questionnaires may leave the researcher or reader wondering why particular students answered or reported certain strategies, the think-aloud allows for a subset of the research sample to describe their actions and thoughts in an actual online reading environment. In contrast, without the data provided by a greater number of participants, the verbal reports

of a small group of students could not be compared to the larger set of peers or contrasted with their own self-reported strategy use.

### **Pilot Study**

In constructing research studies in which think-aloud protocols will be used, Ericsson & Simon (1993) recommend the use of an initial phase of research to study the protocols themselves in order to create coding categories and procedures (p.283). In keeping with this suggestion, a pilot study was conducted in the Spring 2006 to test the research questionnaires and the think-aloud protocol with student participants.

A local school was selected for its proximity to the researcher and the willingness of the administration to participate in the study. After approval from the assistant superintendent, the building principal, and the classroom teacher, a 12<sup>th</sup> grade English class was chosen for the pilot study. Each student in the class gave written assent and obtained parental consent to participate in the study.

All of the students in the class (n=8) completed three questionnaire inventories. The Metacognitive Awareness Reading Strategies Inventory (MARSI) (Mokhtari & Reichard, 2002) allowed each student to self-report on the use of reading strategies such as rereading and note-taking while reading traditional print materials, such as text books and journal articles. The MARSI has a reported reliability coefficient of .93. A modified form of the Online Survey of Reading Strategies (Anderson, 2003) was used to allow students to self-report on the strategies employed while reading materials online, specifically for educational purposes. The last questionnaire allowed students to provide data regarding their habits of Internet use and familiarity with online activities. These

three questionnaires were completed in one, 45-minute class period. All three questionnaires were designed with a 5 point Likert scale response with 1= never or almost never, 2= occasionally, 3=sometimes, 4=usually, and 5=almost always or always.

The following two days, four students were randomly selected (by pulling consent forms from a folder) to participate in the online think-aloud portion of the study. On the second day of the research project, two students accompanied the researcher to the library, where the students had access to computer workstations. Both students were given verbal instructions regarding the think-aloud procedure. Students were instructed to speak exactly the thoughts that were passing through their mind, regardless of the coherence, and were instructed to not attempt to summarize information for the researcher, but to report only those thoughts which directed their actions. One student logged into the computer, while the second waited in another area of the library. On the third day of the research project, this was repeated with the two remaining students. For each of these four students, the computer screen was video-taped as they participated in this portion of the pilot study. The camera was able to capture the participants' voices as well as their use of search strategy, selection of links, and other online behaviors. The camera did not record the student's face, head, clothing, or any other identifiers.

Responses to the surveys indicated that all of the students used the Internet at home for educational and recreational purposes. Only 50% reported using the Internet more than 1-3 hours per week, and 75% reported using a search engine to locate information. With regard to their use of strategy while reading books and other print materials, 87% of the students reported re-reading to increase understanding, and 75% would read aloud when the text was more difficult. However, only 37% reported

“occasionally” having a purpose for reading, and only 12.5% “usually” or “always” evaluated the information presented in the text. When reading online, over 60% of the students reported that they “usually” or “always” print a copy of the information, and very few students, 12.5%, reported using online reference sources and screen helps to understand difficult information.

The students were asked to locate an article online, but were not instructed to use a search engine or tool for locating the article. All four students who participated in the think-aloud protocol used the search engine “Google” to locate their information. Students selected links which appeared earliest on the results, or which were the highest ranked results. They skimmed through the titles and seldom read the summary or the brief amount of information which accompanies the search results. None of the students reported attention to the URL displayed in the search return. Two of the students were very capable of voicing their thoughts as they searched for information. Two of the students had extreme difficulty reporting their processing as they simultaneously used online sources.

### **Research Study**

In the fall of 2007, the study was conducted on a larger scale, using more student participants and with the researcher having more confidence about the process, questionnaire distribution and analysis, and knowledge gained of the think-aloud procedure. None of the questionnaires were modified in any way following the pilot

study. The researcher was more confident and more specific in providing the students with directions and tasks for the think-aloud section of the research project.

During this interim time, the researcher considered the possibility of reading comprehension as a factor improving a student's success or inhibiting the ability to successfully read and process information online. A decision was made to add reading comprehension as an additional variable to consider.

The researcher made contact with a colleague who is an administrator at a career and technical education facility. The researcher was immediately given permission to conduct the research at the site, and given the contact information of several teachers who would likely be willing to participate in the project. After learning about several of the programs, and finally talking with the two instructors in the Sports Management program, the researcher and the instructors agreed to work together to complete the research project. These students were selected for inclusion in the study for two reasons. First, as part of their program, they are involved in computer-based or online research and required to complete a research paper on relevant issues to their field. Second, in a field where information is changing rapidly, much of their research is conducted online with journals and white-paper information rather than books and other print materials. The instructors located a time on their schedule which would accommodate the researcher's presence in the classroom for approximately one week.

### *Description of Setting*

The site selected for participation in the study is a regional career and technical education center. The site is one of four in the regional Career Technology Educational

system in a large urban county in a Midwestern state. Secondary school students and adults apply for admission to the school and are selected based on their career interests and compatibility with the program to which they apply. High school students complete the application and interview process, and may be admitted to the school during their junior and senior years. Different programs are offered at individual campuses or sites; therefore the students at this particular site are drawn from all of the public high schools in the county, also including students from private schools and home-schooled students.

#### *Description of Student Participants*

The student participants were 11<sup>th</sup> and 12<sup>th</sup> grade students enrolled in the Sports Management program. Those who choose to continue their education after high school often enroll in a variety of health-related fields and sports management programs in colleges or universities and other technical training institutions.

The students comprised four course sections of the Sports Management class (two morning sections and two afternoon sections) combined into one classroom with two instructors. There were 36 students enrolled in the combined morning sections and 36 students enrolled in the combined afternoon sections.

#### *Data collection procedures – Survey Data*

On day one in the classroom with the students, the researcher introduced the project and its components to the students. After introductions and an overview of what would be asked and expected from the students, the researcher distributed the student assent forms and the parental consent forms to the students. All of the students agreed to

participate in the project. None of the parental consent forms refused participation in the research study. However, five of the forms limited student participation to the questionnaires only. These students were therefore eliminated from possibly participating in the video-taped think-aloud section of the research study. Several students were absent on one or more of the days the researcher was present in the school. Therefore, the total number of participants was reduced slightly from the original 72 which were possible. The actual number of participants equaled 69 (N=69).

On day two, students were given the three questionnaires to complete in class. The researcher described the information that was being sought by each questionnaire and described the Likert response scale for each questionnaire prior to its distribution. All three questionnaires were completed in approximately one hour. The first instrument completed was the Metacognitive Awareness of Reading Strategies Inventory (MARSI) created by Mokhtari & Reichard (2002). The MARSI (Appendix A) allows for students to self-report on their use of reading strategy as they are engaged in informational reading for school-related tasks. The statements to which students indicate their levels of agreement or use are then categorized into global, support, or problem solving strategies. This research instrument reports a reliability coefficient of .93.

The second survey completed was the Online Reading Strategies Inventory (ORSI) (Appendix B). This survey was created by the researcher for this project. Anderson (2003) modified the original MARSI for use with students learning English as a second language in online reading environments and called it the Online Survey of Reading Strategies (OSORS). The OSORS survey was slightly modified for use in this project, with permission from Anderson, to be used by high school students who were not



reading in a second language or making connections to a primary language. Students self-reported on the strategies they used while reading information online, such as on the Internet, for school purposes. Although this questionnaire was not validated to obtain a reliability coefficient, the questions are extremely similar to those on the original MARSI, with slight variation for the applicability of the strategy with online texts.

The last survey given to the students was brief survey created by the researcher (Appendix C) to investigate the level of online activity of the students and their use of the Internet for both school and personal recreational purposes. This questionnaire was not validated to obtain a reliability coefficient. Therefore, with both the ORSI and the internet use questionnaires or surveys, the data is only as reliable as the instrument.

The MARSI was distributed first, followed by the ORSI, and finally the questionnaire regarding Internet use by students. All three questionnaires were completed in one class session, or approximately 60 minutes. These three questionnaires were used in conjunction to determine the breadth of strategy and use of print and online reading for informational purposes. By comparing the strategies students used in print (MARSI) to the strategies students used online (ORSI), differences and similarities were clear on the use depending upon medium. When this information was then compared to the student's familiarity and use of the Internet in general, the student's level of possible expertise as an Internet user can be compared to their reported use of strategy.

After the completion of the surveys, each student's responses were averaged to give him/her a score on the MARSI, a score on the ORSI, and a score for Internet use. Scores on the MARSI and ORSI of 3.5 and above were classified as high scores, while scores of 3.4 or below were classified as low scores. Internet use scores were coded into a

1-5 point range, with scores of 1 and 2 classified as low scores and 3 to 5 classified as high scores. All scores will be reported in detail in Chapter 4, and fully discussed in Chapter 5.

For entry into the Sports Management program, or any program at the technical school, each student is required to take an assessment measuring his or her basic reading and computational abilities. The Key Train pretest provides instructors in the Career and Technology Education system with information about the student's ability to succeed in various programs. The site used for the research study employs a reading specialist who had access to the scores and provided the researcher with the Flesch-Kincaid equivalents for each student. Reading comprehension scores from this assessment were used to divide the students into three groups. One group was designated a high reading comprehension group. Students in this group had scores of 6 or 7, indicating that the student is reading at the 12<sup>th</sup> grade level or above (Flesch-Kincaid level 12). The average reading comprehension group included students with score of 5, which indicated that the student is reading one to two levels below grade level, on the 10<sup>th</sup> to 11<sup>th</sup> grade level (Flesch-Kincaid level 8). Students in the low reading comprehension group represented scores of 3 or 4, which indicated that the student was reading below the 8<sup>th</sup> grade level (Flesch-Kincaid level 6). By dividing the students into these three groups, the researcher could test the question which asks if strategy use depends on reading comprehension ability.

### *Data Collection Procedures – Think-Aloud Data*

To assure the completeness of data collection, and to account for differences in the variables which could affect student strategy use, students were purposefully selected to participate in the think-aloud portion of the data collection. A schematic (Figure 1) was developed by the researcher to select students for participation in the think-aloud.

*Figure 1 – Participation Schematic*

<i>Student</i>	<i>Comprehension</i>	<i>Internet Use</i>	<i>MARSI</i>	<i>OSORS</i>
1	Low	Low	Low	High
2	Low	Low	Low	Low
3	Low	Low	High	Low
4	Low	Low	High	High
5	Avg	High	High	High
6	Avg	High	Low	High
7	Avg	Low	Low	Low
8	Avg	Low	High	Low
9	Avg	Low	Low	High
10	High	Low	High	High
11	High	Low	Low	Low
12	High	High	Low	Low
13	High	High	High	High

This allowed for the identification of patterns of similarity between high comprehenders vs. low comprehenders, high-frequency Internet users vs. low-frequency Internet users, along with other combinations of variables, which will be relevant, but not exhaustive, and may help to understand strategy use among this population of students.

The remaining three days of the research project allowed the students to participate in the think-aloud procedure. The students this section of the study individually accompanied the researcher to one of two computer labs which were accessible to the students and in common areas of the building. The researcher scheduled the use of the rooms to avoid outside distractions and the presence of other individuals

outside the scope of the study. A video camera was set up in the lab and positioned to capture the screen of the computer which would be used for the think-aloud. The video camera did not capture the student's face, head, clothing, or any other identifier to be recorded. Each participant was given verbal instructions by the researcher about the think-aloud section of the study. Once the student had successfully logged into the network and established an Internet connection, the researcher began recording with the video camera.

In accordance with the recommendations from Ericsson & Simon (1993) the researcher and camera were both positioned behind the student participant. They note that many individuals will become involved in the process or task so that "little notice is taken of the environment, and situational factors have no real effect" (p.375). Likewise, when the researcher is positioned outside of the view of the participant, "the subject will not feel obligated to address the experimenter" (p.376). Setting the camera prior to the student's actual think-aloud procedure allowed the student to forget that his or her voice was being recorded and to become more comfortable talking to and with the researcher and voicing his or her thoughts.

To begin his or her session, the student was asked to complete three practice exercises which required the student to solve a problem and think-aloud. Ericsson & Simon (1993) suggest using practice exercises as a way to minimize or reduce differences in individuals' ability to think-aloud, although some differences in facility are "wholly consistent" and expected, due to the fact that "some people are certainly better able than others to vocalize their thoughts in normal social contexts" (p.250). In the first practice exercise, the student was asked to add a series of numbers, explaining the process of

addition and how he or she arrived at an answer. For the second practice exercise, the student was asked to solve an anagram, explaining the combinations of letters considered, guesses, and other strategies for solving the problem. The third practice exercise required the students to read an excerpt from a magazine article on the subject of alternative fuel sources. After the completion of the three practice exercises, the researcher read aloud from a script (Appendix D) which provided directions for the students while they searched for and read information online. Each student was asked to locate and read an informational article about global warming. With these clear directions and the practice exercises, the majority of the students appeared very comfortable and relaxed during the think-aloud session. The results from these sessions will be presented in Chapter 4 and discussed at length in Chapter 5.

Each of the video-taped think-aloud sessions was transcribed and coded. Ericsson & Simon (1993) suggest that the data obtained from verbal reports, or think-aloud protocols, will provide stronger evidence for a given model if the coding categories have been gathered from other studies, from other evidence, or from analyses of the task (p.284). This type of recommendation justifies the use of pre-existing frameworks and categories to organize and code verbal reports. Therefore, the think-aloud statements produced by the participants were coded and categorized according to the strategic activities identified by Pressley & Afflerbach (1995) used by readers during reading (excluding those pre- and post- reading activities). These strategies include:

- Reading in a linear (front-to-back) fashion
- Reading some sections while ignoring others
- Skimming through the information
- Reading using automatic processes (until a comprehension break-down occurs)
- Reading aloud to better understand text
- Repeating or restating text to clarify or commit to working memory

- Repeating or restating ideas to clarify or commit to working memory
- Making notes
- Pausing and reflecting on the text
- Paraphrasing the text
- Explicitly looking for words, concepts, and ideas within the text
- Looking for patterns within the text
- Making predictions
- Resetting or re-evaluating goals in accordance with information from the text

The researcher then reviewed the documents again to look for other themes which were not included in the list provided by Pressley & Afflerbach (1995) and to look for strategies which seemed more pertinent or unique to the online environment. These other themes are presented in Chapter 5.

**CHAPTER IV**  
**PRESENTATION OF DATA**

## **Introduction**

This chapter presents the results of the quantitative measures (questionnaires) and the qualitative measures (think-aloud protocols) used in this sequential explanatory research study. Creswell (2003) explains that the “structure for the report, like the data analysis, follows the type of strategy chosen for the study” and therefore sequential studies “typically organize the report of procedures” into the two sections, quantitative and qualitative, and that the “writer typically will present the project as two distinct phases, with separate headings for each phase” (p.222).

In keeping with these suggestions for data presentation, the chapter is divided into two main sections, each with smaller subsections. The first section covers the quantitative measures and provides descriptive statistics for questions regarding print strategy, online strategy, and internet use. Each is presented with information about the research question it addresses. The second section provides information about the students in the think-aloud portion of the research, with reports of their particular scores, descriptions of their activities, and statements made during the activity.

## **QUANTITATIVE DATA**

### **Metacognitive Awareness of Reading Strategies Inventory (MARSI)**

One initial research question was “What strategies do students use when reading print materials?” Completion of the MARSI allows the researcher to determine which strategies are reportedly used by students while engaged in a reading task with print



materials, such as books and magazines, when reading for school tasks. The MARSI contains 30 items which assess global reading strategies, problem solving strategies, and support strategies. Each question was answered using the following five-point scale:

- ‘1’ means *I never or almost never do this*
- ‘2’ means *I do this only occasionally*
- ‘3’ means *I do this sometimes (about 50% of the time)*
- ‘4’ means *I usually do this*
- ‘5’ means *I always or almost always do this*

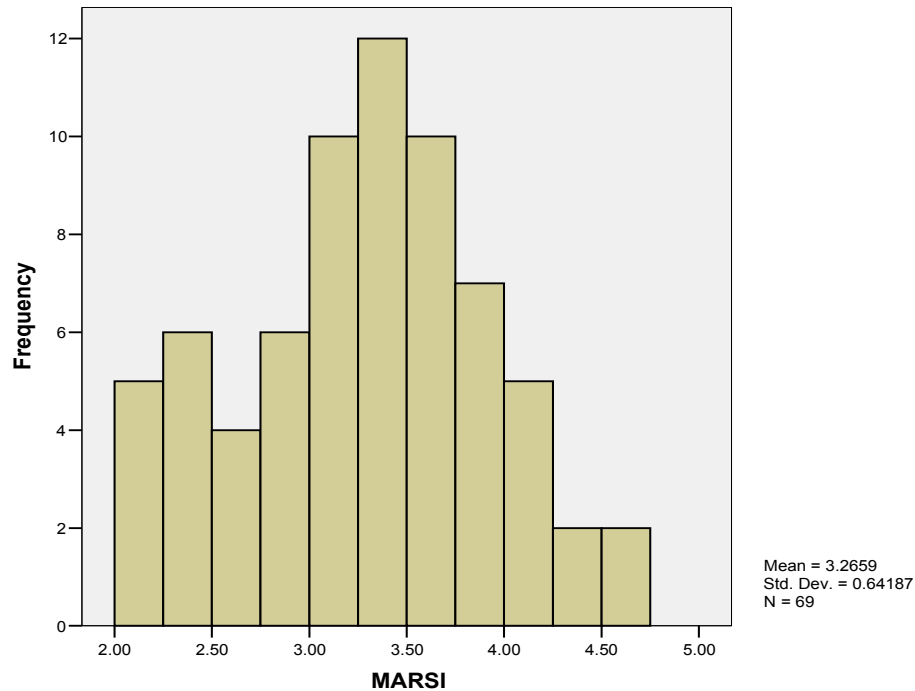
The developers of the inventory suggest that overall mean scores which are above 3.5 indicate high scores, while 2.5 – 3.4 represent average scores, and those falling below 2.4 are low scores (Mokhtari & Reichard, 2002). Table 1 shows the descriptive statistics for the sample on the MARSI, including the range, mean and standard deviation.

*Table 1 – MARSI descriptives*

<b>Item</b>	<b>N</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Mean</b>	<b>SD</b>
MARSI	69	2.03	4.70	3.27	.642

If these scores are evaluated according to the scale suggested by the developers of the MARSI, this sample of students scored in the average range. Figure 2 displays a histogram of the scores, showing the distribution of the entire sample.

*Figure 2 – Distribution of MARSİ scores*



When these scores are separated into the three groups established by the reading comprehension scores, the ranges, means, and standard deviations change slightly. Table 2 shows the MARSİ scores separated into the low, average, and high reading comprehension groups.

*Table 2 – MARSİ descriptives by group*

Group	N	Minimum	Maximum	Mean	SD
Low	10	2.23	4.06	3.31	.565
Average	27	2.26	4.70	3.33	.617
High	32	2.03	4.50	3.19	.695

In this sample, all of the groups scored in the average range on the MARSI. According to these mean scores, none of the groups scored in either the high or low categories of self-reported strategy use when reading print materials. Overall, there was very little variance in the mean scores by group. A one-way ANOVA demonstrates a very low and insignificant F ratio ( $F=.359$ ). This is shown in table 3.

*Table 3 – One-way ANOVA – MARSI by group*

	<i>Sum of Squares</i>	<i>df</i>	<i>Mean Square</i>	<i>F</i>	<i>Sig.</i>
Between Groups	.302	2	.151	.359	.700
Within Groups	27.714	66	.420		
Total	28.016	68			

The 30 items on the MARSI are divided into three general types of reading strategies used by the reader: global, problem-solving, and support. Global reading strategies include skimming the text for characteristics, activating prior knowledge, or setting a purpose for the reading activity. Problem-solving strategies include pausing to reflect on reading, paying closer attention, or reading aloud. Support strategies include taking notes while reading, paraphrasing information, and self-questioning. These results are presented in Table 4.

*Table 4 – MARSI descriptives by category*

<b>Category</b>	<b>N</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Mean</b>	<b>SD</b>
Global	13	2.57	4.14	3.23	.546
Problem-solving	8	3.14	4.85	4.19	.605
Support	9	2.28	4.14	3.33	.610

Sorted in this manner, the students in the research sample scored highest on problem solving strategies and lowest on their global reading strategies.

Because of the relationships between the MARSI and the other questionnaires (the ORSI and the Internet Use Survey), it is beneficial to view the descriptives for individual questions, as well. Each question is listed in table 5 with minimum, maximum, mean, and standard deviation.

*Table 5 – MARSI descriptives by question*

<b>Question</b>	<b>N</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Mean</b>	<b>SD</b>
1. I have a purpose in mind when I read.	68	1.00	5.00	3.38	1.01
2. I take notes while reading to help me understand what I read.	69	1.00	5.00	2.22	1.37
3. I think about what I know to help me understand what I read.	69	1.00	5.00	3.69	1.10
4. I preview the text to see what it's about before reading it.	69	1.00	5.00	3.50	1.34

5. When the text becomes difficult, I read aloud to help me understand what I read.	69	1.00	5.00	3.26	1.40
6. I summarize what I read to reflect on important information.	69	1.00	5.00	2.89	1.27
7. I think about whether the content of the text fits my reading purpose.	68	1.00	5.00	2.94	1.20
8. I read slowly but carefully to be sure I understand what I am reading.	69	1.00	5.00	3.49	1.36
9. I discuss what I read with others to check my understanding.	68	1.00	5.00	2.61	1.18
10. I skim the text first by noting characteristics like length and organization.	69	1.00	5.00	2.49	1.31
11. I try to get back on track when I lose concentration.	68	2.00	5.00	4.20	.890
12. I underline or circle information in the text to help me remember it.	69	1.00	5.00	3.20	1.60
13. I adjust my reading speed according to what I'm reading.	68	1.00	5.00	3.60	1.34
14. I decide what to read closely and what to ignore.	69	1.00	5.00	3.14	1.25
15. I use reference materials such as dictionaries to help me understand what I read.	69	1.00	5.00	2.46	1.41
16. When the text becomes difficult, I pay closer attention to what I'm reading.	69	1.00	5.00	4.22	.998
17. I use tables, figures, and pictures in the text to increase my understanding.	69	1.00	5.00	3.33	1.24
18. I stop from time to time and think about what I'm reading.	69	1.00	5.00	3.26	1.31
19. I use context clues to help me better understand what I'm reading.	69	1.00	5.00	3.12	1.33

20. I paraphrase (restate ideas in my own words) to better understand what I read.	69	1.00	5.00	3.42	1.33
21. I try to picture or visualize information to help me remember what I read.	69	2.00	5.00	4.32	.883
22. I use typographical aids like boldface and italics to identify key information.	69	1.00	5.00	3.46	1.40
23. I critically analyze and evaluate the information presented in the text.	69	1.00	5.00	2.88	1.13
24. I go back and forth in the text to find relationships among the ideas in it.	69	1.00	5.00	2.84	1.28
25. I check my understanding when I come across conflicting information.	69	1.00	5.00	3.37	1.18
26. I try to guess what the material is about when I read.	69	1.00	5.00	3.20	1.31
27. When the text becomes difficult, I re-read to increase my understanding.	69	2.00	5.00	4.49	.779
28. I ask myself questions I like to have answered in the text.	69	1.00	5.00	2.78	1.30
29. I check to see if my guesses about the text are right or wrong.	69	1.00	5.00	2.97	1.28
30. I try to guess the meaning of unknown words or phrases.	69	1.00	5.00	3.50	1.11

1 Some questions skipped or unanswered by students, resulting in different N values.

Again, the scale for each question was a 1 to 5 response on a Likert scale, when:

- '1' means *I never or almost never do this*
- '2' means *I do this only occasionally*
- '3' means *I do this sometimes (about 50% of the time)*
- '4' means *I usually do this*
- '5' means *I always or almost always do this*

Table 6 lists these responses for each question on the MARSI.

*Table 6 – Frequencies of Likert scale response on MARSI*

<b>Question</b>	<b>1 – N (%)</b>	<b>2 – N (%)</b>	<b>3 – N (%)</b>	<b>4 – N (%)</b>	<b>5 – N (%)</b>
	<b>Never</b>	<b>Occasionally</b>	<b>Sometimes</b>	<b>Usually</b>	<b>Always</b>
1. I have a purpose in mind when I read.	3 (4.41%)	9 (13.24%)	23 (33.82%)	25 (36.76%)	8 (11.76%)
2. I take notes while reading to help me understand what I read.	30 (43.48%)	15 (21.74%)	10 (14.49%)	7 (10.14%)	7 (10.14%)
3. I think about what I know to help me understand what I read.	4 (5.80%)	4 (5.80%)	19 (27.54%)	24 (34.78%)	18 (26.09%)
4. I preview the text to see what it's about before reading it.	9 (13.04%)	6 (8.70%)	14 (20.29%)	21 (30.43%)	19 (27.54%)
5. When the text becomes difficult, I read aloud to help me understand what I read.	11 (15.94%)	10 (14.49%)	15 (21.74%)	16 (23.19%)	17 (24.64%)
6. I summarize what I read to reflect on important information.	10 (14.49%)	20 (28.99%)	15 (21.74%)	15 (21.74%)	9 (13.04%)
7. I think about whether the content of the text fits my reading purpose.	10 (14.49%)	14 (20.29%)	20 (29.41%)	18 (26.09%)	6 (8.82%)
8. I read slowly but carefully to be sure I understand what I am reading.	10 (14.49%)	4 (5.80%)	17 (24.64%)	18 (26.09%)	20 (28.99%)
9. I discuss what I read with others to check my understanding.	0 (0%)	17 (24.64%)	18 (26.09%)	15 (21.74%)	3 (4.41%)
10. I skim the text first by nothing characteristics like length and organization.	21 (30.43%)	16 (23.19%)	15 (21.74%)	11 (15.94%)	6 (8.70%)

11. I try to get back on track when I lose concentration.	0 (0%)	5 (7.14%)	6 (8.70%)	27 (38.57%)	30 (42.86%)
12. I underline or circle information in the text to help me remember it.	18 (26.09%)	7 (10.14%)	8 (11.59%)	15 (21.74%)	21 (30.43%)
13. I adjust my reading speed according to what I'm reading.	9 (13.04%)	4 (5.80%)	13 (18.84%)	21 (30.43%)	21 (30.43%)
14. I decide what to read closely and what to ignore.	8 (11.59%)	13 (18.84%)	21 (30.43%)	15 (21.74%)	12 (17.39%)
15. I use reference materials such as dictionaries to help me understand what I read.	25 (36.23%)	11 (15.94%)	19 (27.54%)	4 (5.80%)	10 (14.49%)
16. When the text becomes difficult, I pay closer attention to what I'm reading.	1 (1.45%)	4 (5.80%)	10 (14.49%)	18 (26.09%)	36 (52.17%)
17. I use tables, figures, and pictures in the text to increase my understanding.	6 (8.70%)	11 (15.94%)	22 (31.88%)	14 (20.29%)	16 (23.19%)
18. I stop from time to time and think about what I'm reading.	9 (13.04%)	11 (15.95%)	16 (23.19%)	19 (27.54%)	14 (20.29%)
19. I use context clues to help me better understand what I'm reading.	11 (15.94%)	11 (15.94%)	19 (27.54%)	15 (21.74%)	13 (18.84%)
20. I paraphrase (restate ideas in my own words) to better understand what I read.	8 (11.59%)	10 (14.49%)	14 (20.29%)	19 (27.54%)	18 (26.09%)
21. I try to picture or visualize information to help me remember what I read.	0 (0%)	3 (4.35%)	10 (14.49%)	18 (26.09%)	38 (55.07%)
22. I use typographical aids like boldface and italics to identify key information.	9 (13.04%)	11 (15.94%)	8 (11.59%)	21 (30.43%)	20 (28.99%)



23. I critically analyze and evaluate the information presented in the text.	12 (17.39%)	9 (13.04%)	26 (37.68%)	19 (27.54%)	3 (4.35%)
24. I go back and forth in the text to find relationships among the ideas in it.	15 (21.74%)	10 (14.49%)	22 (31.88%)	15 (21.74%)	7 (10.14%)
25. I check my understanding when I come across conflicting information.	4 (5.80%)	12 (17.39%)	22 (31.88%)	16 (23.19%)	15 (21.74%)
26. I try to guess what the material is about when I read.	10 (14.49%)	11 (15.94%)	16 (23.19%)	21 (30.43%)	11 (15.94%)
27. When the text becomes difficult, I re-read to increase my understanding.	0 (0%)	2 (2.90%)	6 (8.70%)	17 (26.64%)	44 (63.77%)
28. I ask myself questions I like to have answered in the text.	13 (18.84%)	19 (27.54%)	16 (23.19%)	12 (17.39%)	9 (13.04%)
29. I check to see if my guesses about the text are right or wrong.	11 (15.94%)	14 (20.29%)	20 (28.99%)	14 (20.29%)	10 (14.49%)
30. I try to guess the meaning of unknown words or phrases.	5 (7.25%)	4 (5.80%)	25 (36.23%)	21 (30.43%)	14 (20.29%)

All of the relationships to questions on other surveys and analysis of means will be thoroughly discussed in Chapter 5.

### **Online Reading Strategies Inventory (ORSI)**

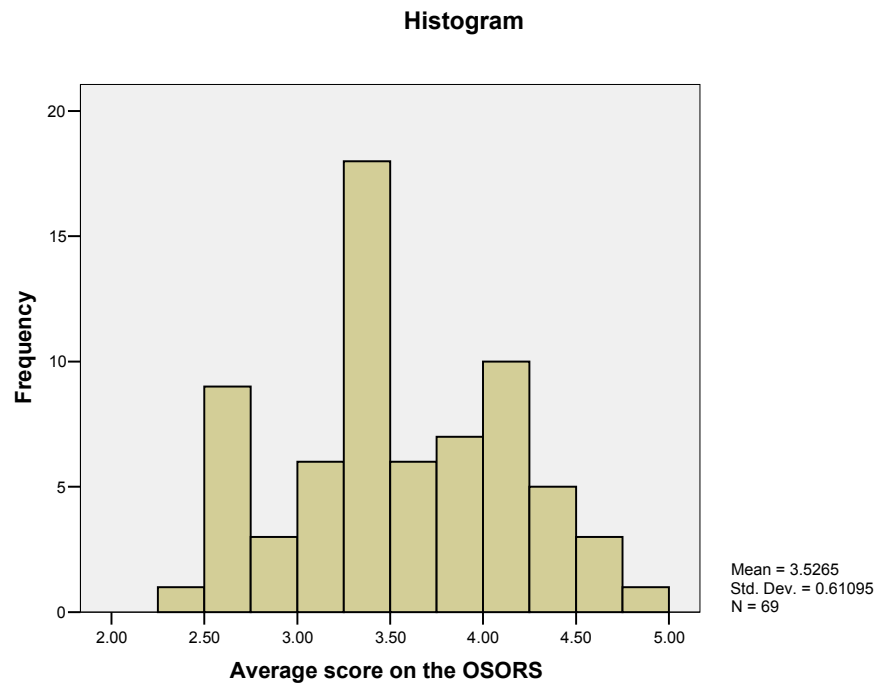
One of the initial research questions of this study focuses on the strategies that students report using while reading materials on the web. These online materials are mostly informational and used for school or research purposes. The inventory used to measure these strategies was developed from the MARSI, modified for use with second-language readers, and further adapted for use in this study (references to reading in native and second languages removed). To answer the research question “What strategies do students use while reading online?” each student completed the Online Reading Strategies Inventory (ORSI). The twenty-three questions on the ORSI correspond to the questions and categories on the MARSI, and several are very similar in nature, referring to online environments rather than print materials.

*Table 7 – ORSI descriptives*

<b><i>Item</i></b>	<b><i>N</i></b>	<b><i>Minimum</i></b>	<b><i>Maximum</i></b>	<b><i>Mean</i></b>	<b><i>SD</i></b>
ORSI	69	2.30	4.86	3.53	.611

For the entire sample of students, the reported online strategy mean falls into the high range. Figure 3 displays a histogram of the scores to demonstrate the distribution of scores for the sample.

Figure 3 – Distribution of ORSI scores



When these scores are separated into the three groups established by the reading comprehension scores, the ranges, means, and standard deviations change slightly. Table 8 shows the ORSI scores separated into the low, average, and high reading comprehension groups.

Table 8 – ORSI by group

GROUP	N	Minimum	Maximum	Mean	SD
1.00	10	2.56	4.43	3.56	.518
2.00	27	2.30	4.60	3.59	.714
3.00	32	2.56	4.86	3.45	.550

Students in the average group outscored their peers for online strategy use. Both the average and low groups' means fall into the high strategy use range, while the high comprehension group score falls just below the 3.5 division to place it into the average range (although mathematical rounding would place it, too, at the lowest edge of the high range).

Overall, there is little variance in the mean scores of the three groups. A one-way ANOVA test on the ORSI by group demonstrates a very low and insignificant result, shown in table 9.

*Table 9 – One-way ANOVA – ORSI by group*

	<b><i>Sum of Squares</i></b>	<b><i>df</i></b>	<b><i>Mean Square</i></b>	<b><i>F</i></b>	<b><i>Sig.</i></b>
Between Groups	.296	2	.148	.389	.679
Within Groups	25.086	66	.380		
Total	25.382	68			

The 23 items on the ORSI are also divided into three general types of reading strategies used by the reader: global, problem-solving, and support. Global reading strategies include setting a purpose for the reading activity, choosing which ideas to ignore or retain, and using typographical features of the online text to identify important information. Problem-solving strategies include reading aloud, adjusting reading speed,

and visualizing information. Support strategies include printing a hard copy of the text, taking notes, or using online reference links. These results are presented in Table 10.

*Table 10 – ORSI descriptives by category*

<b>Category</b>	<b>N</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Mean</b>	<b>SD</b>
global	11	2.93	4.09	3.60	.343
problem	6	3.49	4.10	3.78	.264
support	6	2.23	3.59	3.15	.500

Scored in this manner, students in the research sample scored highest on problem solving strategies, and lowest on support strategies. An analysis of these findings will be discussed further in Chapter 5.

Again, as with the MARSII questions, the ORSI questions can be viewed individually for comparison between the print and online environment. In Table 11, the results of each question, including the minimum score, maximum score, mean, and standard deviation is listed.

*Table 11 – ORSI descriptives by question*

<b>Question</b>	<b>N</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Mean</b>	<b>SD</b>
1. I have a purpose in mind when I read online.	69	1.00	5.00	3.92	1.03

2.	I take notes while reading online to help understand what I read.	69	1.00	5.00	2.23	1.18
3.	I think about what I already know to help me understand what I am reading online.	69	1.00	5.00	3.44	1.15
4.	I look at the overall view of the text before I start reading online	69	1.00	5.00	3.53	1.29
5.	I read out loud to myself when the online text gets confusing or difficult to understand.	69	1.00	5.00	3.07	1.54
6.	I think about whether the online text fits with my purpose for reading.	69	1.00	5.00	3.34	1.17
7.	I read slowly and carefully to understand what I am reading online.	69	1.00	5.00	3.57	1.31
8.	I review the online text, looking at length and organization.	69	1.00	5.00	3.33	1.34
9.	I try to get back on track when I lose concentration.	69	1.00	5.00	4.00	1.02
10.	I print a copy of the online text so I can write on it and make notes	69	1.00	5.00	3.59	1.46
11.	I adjust my reading speed according to what I am reading online.	69	1.00	5.00	3.57	1.21
12.	When reading online, I decide what to read carefully and what I can choose to ignore.	69	1.00	5.00	3.56	1.16
13.	I use the links to reference materials (like online dictionaries)to help me when I don't understand what I am reading.	69	1.00	5.00	3.23	1.36
14.	When the online text becomes difficult, I pay closer attention.	69	2.00	5.00	4.10	.876

15. I read information on the Internet for school purposes.	68	2.00	5.00	4.02	.929
16. I use the pictures and other graphics on the sites to help understand what I am reading online.	68	1.00	5.00	4.08	1.04
17. I stop occasionally and think about what I am reading online.	69	1.00	5.00	3.49	1.10
18. I paraphrase (say in my own words) what I read online.	69	1.00	5.00	3.24	1.38
19. I visualize or picture in my mind the things I read online.	69	1.00	5.00	3.97	1.09
20. I use the typographical features of the text (bold, italics, headings, colors, and fonts) to identify important information.	67	1.00	5.00	3.77	1.30
21. I critically analyze and evaluate the information I find in online texts.	69	1.00	5.00	2.92	1.16
22. I scroll up and down in the online text to remember and connect information together.	69	1.00	5.00	3.59	1.24
23. I check to see if I understand when I read new information.	69	1.00	5.00	3.68	1.14

Also, for the ORSI, it is helpful to see how many students answered each question according to the Likert scale provided. Table 12 provides the number and percentage of the total sample for each category response for each question.

*Table 12 – Frequencies of Likert scale response on ORSI*

<b>Question</b>	<b>1 – N (%)</b>	<b>2 – N (%)</b>	<b>3 – N (%)</b>	<b>4 – N (%)</b>	<b>5 – N (%)</b>
	<i>Never</i>	<i>Occasionally</i>	<i>Sometimes</i>	<i>Usually</i>	<i>Always</i>
1. I have a purpose in mind when I read online.	0 (0)	7 (10.14%)	18 (26.09%)	17 (24.64%)	27 (39.13%)
2. I take notes while reading online to help understand what I read.	27 (39.13%)	13 (18.84%)	16 (23.19%)	12 (17.39%)	1 (1.45%)
3. I think about what I already know to help me understand what I am reading online.	6 (8.70%)	7 (10.14%)	18 (26.09%)	26 (37.68%)	12 (17.39%)
4. I look at the overall view of the text before I start reading online	9 (13.04%)	2 (2.90%)	20 (28.99%)	19 (27.54%)	19 (27.54%)
5. I read out loud to myself when the online text gets confusing or difficult to understand.	18 (26.09%)	8 (11.59%)	11 (15.94%)	15 (21.74%)	17 (24.64%)
6. I think about whether the online text fits with my purpose for reading.	5 (7.25%)	12 (17.39%)	18 (26.09%)	22 (31.88%)	12 (17.39%)
7. I read slowly and carefully to understand what I am reading online.	6 (8.70%)	10 (14.49%)	13 (18.84%)	18 (26.09%)	22 (31.88%)
8. I review the online text, looking at length and organization.	8 (11.59%)	12 (17.39%)	16 (23.19%)	15 (21.74%)	18 (26.09%)
9. I try to get back on track when I lose concentration.	2 (2.90%)	4 (5.80%)	12 (17.39%)	25 (36.23%)	26 (37.68%)
10. I print a copy of the online text so I can write on it and make notes.	9 (13.04%)	9 (13.04%)	12 (17.39%)	10 (14.49%)	29 (42.03%)



11. I adjust my reading speed according to what I am reading online.	6 (8.70%)	7 (10.14%)	14 (20.29%)	25 (36.23%)	17 (24.64%)
12. When reading online, I decide what to read carefully and what I can choose to ignore.	5 (7.25%)	7 (10.14%)	17 (24.64%)	24 (34.78%)	16 (23.19%)
13. I use the links to reference materials (like online dictionaries) to help me when I don't understand what I am reading.	11 (15.94%)	9 (13.04%)	17 (24.64%)	17 (24.64%)	15 (21.74%)
14. When the online text becomes difficult, I pay closer attention.	0 (0%)	3 (4.35%)	14 (20.29%)	25 (36.23%)	27 (39.13%)
15. I read information on the Internet for school purposes.	0 (0%)	3 (4.35%)	19 (27.54%)	19 (27.54%)	27 (39.13%)
16. I use the pictures and other graphics on the sites to help understand what I am reading online.	1 (1.45%)	5 (7.25%)	13 (18.84%)	17 (24.64%)	32 (46.37%)
17. I stop occasionally and think about what I am reading online.	5 (7.25%)	6 (8.70%)	20 (28.99%)	26 (37.68%)	12 (17.39%)
18. I paraphrase (say in my own words) what I read online.	11 (15.94%)	11 (15.94%)	12 (17.39%)	20 (28.99%)	15 (21.74%)
19. I visualize or picture in my mind the things I read online.	3 (4.35%)	3 (4.35%)	15 (21.74%)	20 (28.99%)	28 (40.58%)
20. I use the typographical features of the text (bold, italics, headings, colors, and fonts) to identify important information.	6 (8.70%)	7 (10.14%)	8 (11.59%)	21 (30.43%)	25 (36.23%)

21. I critically analyze and evaluate the information I find in online texts.	10 (14.49%)	13 (18.84%)	24 (34.78%)	16 (23.19%)	6 (8.70%)
22. I scroll up and down in the online text to remember and connect information together.	4 (5.80%)	9 (13.04%)	21 (30.43%)	12 (17.39%)	23 (33.33%)
23. I check to see if I understand when I read new information.	4 (5.80%)	6 (8.70%)	17 (24.64%)	23 (33.33%)	19 (27.54%)

### **Correlations and Comparisons between MARSİ and ORSI**

The third research question addresses the similarities between reading strategy in print and online environments, and how these are comparable or different. The following section compares the data results side by side, noting correlations between the measures and relationships between comprehension groups and scores in both environments.

The MARSİ and the ORSI are highly correlated (Pearson's  $r = .783$ ). Table 13 shows the results from the bivariate correlation and demonstrates the relationship between these two variables.

*Table 13 – Correlation between MARSI and ORSI*

		<i>MARSI</i>	<i>ORSI</i>
MARSI	Pearson Correlation	1	.783(**)
	Sig. (2-tailed)		.000
	Sum of Squares and Cross-products	28.016	20.870
	Covariance	.412	.307
	N	69	69
ORSI	Pearson Correlation	.783(**)	1
	Sig. (2-tailed)	.000	
	Sum of Squares and Cross-products	20.870	25.382
	Covariance	.307	.373
	N	69	69

\*\* Correlation is significant at the 0.01 level (2-tailed).

For each individual student, the question can be asked “Does environment in which students are reading influence their strategy use?” Using a paired t-test, each student’s response can be examined in each of the reading environments, print and online. The results of the paired statistics are listed in Table 14 and the results of the paired test in Table 15.

*Table 14 – Paired sample statistics– MARSI & ORSI*

	Mean	SD	SEM	95% Confidence Interval of the Difference		t	df	Sig.
				Lower	Upper			
MARSI – ORSI	-.260	.414	.049	-.360	-.161	-5.23	68	.000*

*\*Two tailed significance  $p < .01$*

*Table 15 – Paired Differences – MARSI & ORSI*

	Mean	N	SD	SEM
MARSI	3.26	69	.641	.077
ORSI	3.52	69	.610	.073

Therefore, the conclusion is that there is a statistically significant difference in students' strategy use depending upon the environment, print or online. An analysis of these findings will be discussed in Chapter 5 and their implications discussed in Chapter 6.

### **Internet Use Data**

The fourth research question asks whether online strategy use is related to the student's familiarity and use of the Internet. To attempt to answer this question, the Internet Use Survey was designed by the researcher to gauge the student's use of general

programs and capabilities of the internet (e-mail, search engines, websites, IM) and to estimate a weekly amount of time students engaged with these resources. The same

Likert scale responses were used from the previous measures, in which:

- 1 means *I never or almost never do this*
- 2 means *I do this only occasionally*
- 3 means *I do this sometimes (about 50% of the time)*
- 4 means *I usually do this*
- 5 means *I always or almost always do this*

The results of this survey are presented in Table 16.

*Table 16 – Frequencies of Internet use responses*

<i>Question</i>	<i>1 – N (%)</i>	<i>2 – N (%)</i>	<i>3 – N (%)</i>	<i>4 – N (%)</i>	<i>5 – N (%)</i>
	<i>Never</i>	<i>Occasionally</i>	<i>Sometimes</i>	<i>Usually</i>	<i>Always</i>
1. I use the Internet at home	11 (15.94%)	6 (8.70%)	5 (7.25%)	12 (17.39%)	34 (49.27%)
2. I use the Internet at school	4 (5.80%)	16 (23.19%)	32 (46.38%)	5 (7.25%)	12 (17.39%)
3. I use the Internet in other places (parents' office; library; friends' homes)	14 (20.29%)	19 (27.54%)	19 (27.54%)	7 (10.14%)	10 (14.49%)
4. I use the Internet for sending and receiving e-mail	9 (13.04%)	6 (8.70%)	13 (18.84%)	11 (15.95%)	30 (43.48%)
5. I use the Internet for IM & chat	26 (37.68%)	9 (13.04%)	11 (15.94%)	11 (15.94%)	12 (17.39%)
6. I use the Internet for school research	0 (0%)	4 (5.80%)	14 (20.29%)	19 (27.54%)	32 (46.38%)
7. I use the Internet for entertainment	9 (13.04%)	8 (11.59%)	11 (15.94%)	19 (27.54%)	22 (31.88%)
8. I use search engines to find information I need	4 (5.80%)	2 (2.90%)	9 (13.04%)	14 (20.29%)	40 (57.97%)

9. I rely on friends to tell me about important websites	20 (28.99%)	23 (33.33%)	14 (20.29%)	8 (11.59%)	4 (5.80%)
10. I use websites provided by teachers or librarians at school	6 (8.70%)	11 (15.94%)	25 (36.23%)	16 (23.19%)	11 (15.94%)
11. I can generally find what I am looking for online	0 (0%)	2 (2.90%)	6 (8.70%)	32 (46.38%)	29 (42.03%)
12. I often give up because I can't find what I need on the Internet	37 (53.62%)	17 (24.64%)	9 (13.04%)	3 (4.35%)	3(4.35%)
13. I generally get online, find what I need, and get off to do other things	7 (10.14%)	7 (10.14%)	26 (37.68%)	16 (23.19%)	13 (18.84%)
14. I tend to "get lost" online and spend a lot of time doing things I hadn't planned	18 (26.08%)	18 (26.08%)	15 (21.73%)	12 (17.39%)	5 (7.25%)
15. Everything I need for school research is online	3 (4.35%)	11 (15.94%)	20 (28.99%)	24 (34.78%)	11 (15.94%)

The descriptive statistics from each question on the Internet survey are presented in Table 17. Each includes the maximum, minimum, mean, and standard deviation.

*Table 17 – Descriptive statistics for Internet Use Survey*

<b>Question</b>	<b>N</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Mean</b>	<b>SD</b>
1. I use the Internet at home	68	1.00	5.00	3.76	1.53
2. I use the Internet at school	69	1.00	5.00	3.07	1.11
3. I use the Internet in other places (parents' office; library; friends' homes)	69	1.00	5.00	2.71	1.30

4. I use the Internet for sending and receiving e-mail	69	1.00	5.00	3.68	1.43
5. I use the Internet for IM & chat	69	1.00	5.00	2.62	1.54
6. I use the Internet for school research	69	1.00	5.00	4.14	.943
7. I use the Internet for entertainment	69	1.00	5.00	3.53	1.38
8. I use search engines to find information I need	69	1.00	5.00	4.21	1.14
9. I rely on friends to tell me about important websites	69	1.00	5.00	2.31	1.18
10. I use websites provided by teachers or librarians at school	69	1.00	5.00	3.21	1.16
11. I can generally find what I am looking for online	69	1.00	5.00	4.27	.745
12. I often give up because I can't find what I need on the Internet	69	1.00	5.00	1.81	1.10
13. I generally get online, find what I need, and get off to do other things	69	1.00	5.00	3.30	1.19
14. I tend to "get lost" online and spend a lot of time doing things I hadn't planned	68	1.00	5.00	2.52	1.26
15. Everything I need for school research is online	69	1.00	5.00	3.42	1.07

On the Internet Use Survey, an additional question asked the students to estimate the amount of time spent online each week. Choices were *1-3 hours*, *4-6 hours*, *7-10 hours*, *11-15 hours*, and *16 or more hours*. For analysis, these were ranked 1(low)-5(high). The results are presented in Table 18.

*Table 18 – Estimate of time spent online each week*

	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
	<i>1 to 3 hrs</i>	<i>4-6 hrs.</i>	<i>7-10 hrs</i>	<i>11-15 hrs</i>	<i>16 or more hrs</i>
<i>N=69</i>	33 (47.8%)	20 (29%)	13 (18.8%)	1 (1.4%)	2 (2.9%)

The results from this table indicate that this sample of students do not spend a great deal of time online each week. Approximately 95% of the student sample is online less than 10 hours per week.

### **Reading Comprehension Data**

To determine the effects of reading comprehension on the use of strategy with both print and online texts, a split-plot ANOVA was used. For this analysis, the levels of the reading comprehension groups served as the between factor, and the two strategy inventories were the within factor. The summary table is presented as Table 19.



Table 19 – Split-Plot ANOVA – Reading Comprehension and Strategy

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
strategy	Sphericity Assumed	1.787	1	1.787	20.234	.000*
	Greenhouse-Geisser	1.787	1.000	1.787	20.234	.000*
	Huynh-Feldt	1.787	1.000	1.787	20.234	.000*
	Lower-bound	1.787	1.000	1.787	20.234	.000*
strategy * Comp	Sphericity Assumed	.001	2	.000	.003	.997
	Greenhouse-Geisser	.001	2.000	.000	.003	.997
	Huynh-Feldt	.001	2.000	.000	.003	.997
	Lower-bound	.001	2.000	.000	.003	.997
Error(strategy)	Sphericity Assumed	5.828	66	.088		
	Greenhouse-Geisser	5.828	66.000	.088		
	Huynh-Feldt	5.828	66.000	.088		
	Lower-bound	5.828	66.000	.088		

\* $p < .01$

The split-plot ANOVA results demonstrate that there is only a main effect for the strategy. The lack of a significant interaction between strategy and comprehension indicates that the differences between reading comprehension groups did not affect the use of strategy, either print or online. These findings will be further analyzed in chapter 5.

### **Student Participants Selected for the Think-Aloud**

Thirteen students were selected for participation in the think-aloud procedure based on their responses to the three surveys and their reading comprehension scores. The goal was to select students who answered the questions in such a way that they obtained a range of scores and combinations which would be interesting to study theoretically and to

make comparisons. Creswell (2003) notes that by following quantitative data collection with qualitative analysis the researcher is able to better explain and examine what may be unexpected results (p.215). Table 20 provides a list of these students' scores on each measure and survey. All student names are pseudonyms.

*Table 20 – Students selected for think-aloud*

<i>Student</i>	<i>Comprehension</i>	<i>MARSI</i>	<i>ORSI</i>	<i>Internet Use</i>
Erica	1 (Low)	3.06 (Low)	3.69 (High)	1 (Low)
Samantha	1 (Low)	2.23 (Low)	3.43 (Low)	1 (Low)
Ethan	1 (Low)	4.00 (High)	3.48 (Low)	1 (Low)
Julie	1 (Low)	3.50 (High)	4.43 (High)	1 (Low)
Renee	2 (Avg)	3.30 (Low)	4.43 (High)	2 (Low)
Amy	2 (Avg)	3.63 (High)	4.08 (High)	2 (Low)
James	2 (Avg)	3.60 (High)	3.78 (High)	5 (High)
Michael	2 (Avg)	2.93 (Low)	3.43 (High)	3 (High)
Teresa	2 (Avg)	3.07 (Low)	3.47 (Low)	1 (Low)
William	3 (High)	3.96 (High)	3.91 (High)	1 (Low)
Natalie	3 (High)	2.20 (Low)	3.04 (Low)	1 (Low)
Ashley	3 (High)	2.93 (Low)	2.60 (Low)	3 (High)
Olivia	3 (High)	4.36 (High)	4.17 (High)	1 (Low)

## QUALITATIVE DATA

### **Presentation of Individual Student Reports**

Each student who participates in the think-aloud procedure can be viewed as an individual case, and the statements, attitudes, and responses generated by the verbal reporting and the related questionnaire inventories can be analyzed using qualitative methodology. As Creswell (2003) suggests, qualitative data can be used to further explain and interpret the results of a primarily quantitative study (p.215). In this sequential explanatory research design, the cases are carefully chosen either to support the prior theoretical suppositions which guide data collection and analysis or serve as contrasts in which the resulting differences can be theoretically discussed.

In this section, I will present each student individually as he/she worked through the online activity and think-aloud procedure. Student comments, as well as researcher observations, will be presented for each of the thirteen students engaged in these tasks. All student names are pseudonyms.

#### **Student 1: Erica**

*(low reading comprehension, low MARSIS score, high ORSI score, low Internet use)*

Erica had difficulty with the practice exercises and seemed somewhat reluctant to participate in the think-aloud; although, she was very talkative and very compliant. She quickly stated that she was not a good student. As she read through the passage, Erica would skip across several sentences and then quickly become confused about the overall

meaning of the paragraph. She would ask herself questions such as “What did that say?” or “What was that title?” as she skimmed the text. She was initially interested in the article, stating “um, this is a real story...this reminds me of an actual story that I would pay attention to on the news or in the newspaper... this is interesting to me.” Anytime Erica encountered a word she did not recognize, she would guess at an alternate meaning. Erica mentioned “I don’t know these words, so I just skip over them – usually if I read longer I can guess what it is ... or think of another word ... yeah there’s several here I don’t know.” At one point, Erica described the way that she was reading though the material, that she was “not skimming, but not reading like it was directions or something.” Contradicting her earlier statements, she said, “I’m not really a news person ... it feels like it’s dragging ... this isn’t appealing to me.” Later she commented it seemed more like the material she was assigned, but chose not read, for her classes at school. “It reminds me of history classes I’ve taken ... it was hard to stay awake to read.” She also commented, “Some of these sentences don’t even make sense ... it’s like they’re fragment sentences or something. It’s not as interesting as it was at first ... um, it got too specific.” Overall the think-aloud was somewhat difficult for Erica to complete, and she finally stopped talking and began playing with her hair.

### **Student 2: Samantha**

*(low reading comprehension, low MARSI, low ORSI, low Internet use)*

Samantha easily completed the practice exercises finishing the anagram almost as soon as the researcher finished giving her the letters to use. She quietly worked through the think-aloud session, with reminders from the researcher to continue talking and

thinking aloud. Samantha would point to the screen with her finger as she re-read sentences or phrases. Samantha was one of the few students who did not use the search engine Google to locate an article. Instead, she used Yahoo to find the article she read for the activity, because she stated that she “liked it best.” After typing in her search terms, Samantha read quietly through her choices, asking herself “do I want the effects or causes ... I think the causes ... it might say something about cars, too” (referring to the information from the practice exercise). She scanned through the search results and selected a site whose description read “What causes global warming?” She read through the material speaking softly to herself, often reading aloud in a very quiet voice. She noted that the site gave “lots of data” and “lists of gasses” that were “important.” The site she selected provided information which she used, stating “it says burning fossil fuels is the main cause – it gives data.” She agreed that she “guess[ed] electric cars could be good – not as much pollution.” Moments later, she stated that she was “wondering what Moore’s law is ...” Later she paraphrased some of the statements of the article and said “they’re just asking if we should have batteries that would blow up or global warming and stuff.”

### **Student 3: Ethan**

*(low reading comprehension, high MARSI, low ORSI, low Internet use)*

The think-aloud activity was difficult for Ethan to complete. He was very quiet and did not offer the researcher much in the way of verbal data. He read much of the information very quietly to himself, without speaking or subvocalizing, and generally

only responded to the researcher's prompts to think-aloud ("OK...tell me what you're thinking"). He selected Google for locating an article for the activity, and chose the first result displayed in the return. The school server had blocked that particular site, so Ethan was forced to return to the result screen, where he then skimmed through some of the titles and made a second selection. The article reported on several world nations meeting to discuss global warming, and Ethan commented that it "is just pretty much the same thing ... chaos with vehicles ... it's just like you hear on the news all the time ... yeah, umm, this is just about all the developing countries." He continued to read silently, finally stating "this says that President Bush spends tons of money on this ... that's about it."

#### **Student 4: Julie**

*(low reading comprehension, low MARSI, high ORSI, high Internet use)*

Julie was very good at conveying her thoughts as she participated in the think-aloud activity. She quickly admitted when the information she read did not make sense, or if she became distracted or did not understand what she read. Early on she commented "I'm thinking about what this is ... I'm not really understanding these numbers here." She used the cursor to track her place on the screen, and would state her comprehension breakdowns in clear terms. "I'm not really understanding this ... I'm going down here, but I don't know what this means ... OK – this isn't something I really know much about, so this is going to ... you know ... make me read closer and go back over it a few times

... like these last two sentences here I've had to read a couple of times." Later she reported, "I'm not quite sure what this paragraph is talking about ... it was a little confusing ... I really had to focus on the words." She used Google to locate an article about global warming. She said that she often used Google ("that's where I usually go") and she made her choices regarding the article from the search results. "It gives me a bunch of stuff ... I'm just searching through this right here [the results summaries] to see what catches my eye ... so I'll pick one ... but if I don't like it I'll go back." When she became disinterested, Julie commented "I'm thinking ... what I'm thinking is that I wouldn't really want to read this on my own ... well, that paragraph was easier ... not as hard to read." Overall, Julie skipped through large sections of the text which could have contributed to her confusion and disinterest, or which may have been a result of these factors.

### **Student 5: Renee**

*(avg reading comprehension, low MARSI, high ORSI, low Internet use)*

Renee was a very quiet student. She would not engage in conversation with the researcher initially as we walked to the computer lab to begin the think-aloud session. Renee easily completed the math practice exercise, but was very frustrated by the anagram. When she began the think-aloud activity, Renee remained somewhat quiet, reading softly to herself. She immediately scanned the entire page and determined a location to begin reading. Renee would stop frequently, comment that she was confused,

move back in the text and re-read two or three sentences for clarification. At one point, she said, "it's kind-of confusing, but I am just re-reading it." She would then either restate the information explicitly or paraphrase the idea with her own words. "Um ... I agree that we need to find some breakthroughs because eventually the environment is just going to be too bad ... I do think cars and global warming is [sic] linked ... the way we use cars, use gas, we just take advantage of our things. It's just causing problems." She was highly engaged with the information in the text and would repeatedly make comments about her disbelief of the statements and question the truth or validity of the claims on her page. She commented "Well, on this one I think they're overestimating it – there's no way they know - I mean – there's no way we'll be out in 40 years – they can estimate or whatever but there's no way they can really know." Overall, Renee read very slowly, and used the cursor to track her way through very dense passages. She scrolled around images and other graphic representations of information to the next section of text.

#### **Student 6: Amy**

*(avg reading comprehension, high MARSI, high ORSI, low Internet use)*

Amy was extremely talkative as she accompanied the researcher to the computer lab. She completed the practice exercises quickly with little apparent difficulty. Amy was a very good verbalizer who could voice her thoughts with ease. She would read aloud quietly and allow moments of confusion or boredom to be made known immediately.



“Hmm ... ok. Well, most of this stuff doesn’t make sense to me.” Amy progressed through her text quickly by reading the section headings and choosing to read only the sections which were of interest to her. “I don’t know what most of these words mean. When all these big words are together it’s confusing.” Occasionally she would skip a section, scroll down, and then scroll up to return to a skipped section. “These are really long sentences ... see there’s more big words – well, not all big but when they’re all together they don’t make sense. See “enthusiastic expectations for electric vehicles” – they could have just said ‘high hopes for electric cars’.” She mentioned that she was losing interest in the topic and began reading aloud with more volume and would re-read sections several times. “I’m starting to lose interest ... I’m having to read things again to make sense.” Amy also noted her preference for reading aloud to herself, stating “I read out loud a lot ... I don’t know ... it makes sense if I say it out loud to myself.” She moved the cursor to the right-hand side of her screen and started a video clip, though she seemed surprised that it was not simply a link to more text. She quickly closed the window of the video and returned to the text, only to choose another video. She allowed this video to play for a minute, said “oh yeah ... I think I heard about this on the news ... I want to see this real quick,” then apologized for the diversion. She commented “most of the time I get real bored. The videos are interesting. I like the words. I can’t make sense out of a bunch of words.” She then closed the window and returned to the text. She skipped around and commented again that she was bored. At the conclusion of the activity, Amy declared that she was a better writer than reader. She said, “I am a much better writer than I am a reader. I mean, I’m good, and I have good reading scores on my reading tests and stuff. I don’t know. I’m just better with stories and stuff than facts.

When it's just facts, I get bored and start doing this a lot, and clicking around and stuff."

To emphasize her comments, Amy began scrolling wildly and clicking at random images to exaggerate her online moves when "bored" and unengaged.

### **Student 7: James**

*(avg reading comprehension, high MARSI, high ORSI, high Internet use)*

James was very comfortable and very capable during the think-aloud. During the activity, he would alternately summarize or restate the information and read aloud. James was by far the most vocal participant in the think-aloud activity. James possessed great deal of background knowledge of the material and would often relate the new information to that which he already knew. James noted his preference for using Google when looking for information online, and said that he looked for keywords when choosing an article from the search results. He said that he seldom chose "the first one, but I've done enough research that I've learned to read what they're about ... this one should be good because it's epa.gov." He quickly read through the information, easily translating the chemical abbreviations (i.e. CO<sub>2</sub> into 'carbon dioxide'). While reading about alternative fuels and global warming, James made a connection to what he already knew about cars. "OK – they're talking about some kind of ceramic – I don't know what that is – and I don't know what a catalyst is ... ok here it says that they're using gasoline fuel but it combusts like a diesel." He stated "yeah ... ok ... I know a lot about engines ... about that combustion ... it uses combustion ... the pistons ... the chamber ... the chamber fills with fuel and air and is ignited ... the spark plug ignites it and causes the

piston to explode down which turns everything else in the motor which results in the car moving.” James used the cursor to keep track of his place on screen, tracking it along each line as he read aloud or summarized the text, constantly making connections to what he already knew. At one point he said “ok – they’re saying that the engines haven’t changed in 40 years ... nuclear power is depleted. Hmmm ....” He then continued to subvocalize and read through the text, stating “yeah, cause ethanol is used for drag racing cars – ok, they’re worried about changes because of fuel depletion.” He did not preview the text overall prior to beginning reading and became somewhat concerned with the text length as he continued to read. He frequently used the hyperlinks to move away from his original document, but never followed the links more than one page away. Once, he selected a link that was not another page, but a document. He did not notice this on the file extension, but as the page began to load, he commented “Oh, that’s not what I wanted.” As new pages loaded, or when he would return to the original page, James would become frustrated if the pages loaded slowly, and would repeatedly hit the refresh button. He was very persistent when he did not understand the information, reading a sentence again and again, restating the information and substituting other words until he felt it made sense. Toward the end of the activity, he became confused about the meaning of the word “sink” in the context of the article. “It says a sink is a reservoir – I’ve never heard of this before – certain things are sinks – I’ve never heard of this – hmmm ... ok ... it says natural elements – ok it says certain things on the planet are acting as ... acting as ... places where elements are absorbed and let out.” James struggled through this very unfamiliar passage and completed the activity.

### **Student 8: Michael**

*(avg reading comprehension, low MARSI, high ORSI, high Internet use)*

Michael completed the practice exercises quickly, and was highly engaged in the think-aloud activity. He was very interested in the topic, and possessed a moderate amount of background knowledge. Michael noticed when he began to lose focus or stopped paying attention to the text and would re-read a sentence from the beginning to get back on track. As he read through a paragraph, Michael stated that he was “trying to read it and stay focused... trying to picture it” in his mind, and said “I know a lot about cars, so this is pretty interesting.” Michael admitted that he used the search engine Google to find information he needed online, and said that he used his computer at home quite a bit. He said “The good thing about Google is that I am a terrible speller, so if I do it wrong it knows it.” As he was reading, Michael would quietly read aloud the first sentence of a paragraph, skip to the last sentence, and then decide to either read the paragraph in its entirety or skip to the next paragraph. He did not move backwards through the text or revisit skipped paragraphs. Michael read aloud often and used the cursor to keep track of his place within the text. Often, he would highlight passages with the cursor and restate the information to himself. When the cursor passed over active hyperlinks within the document, Michael did not follow any of the links, even when they might have been helpful in explaining unfamiliar words and concepts. Likewise, he ignored all of the charts and other graphical presentations of the information on the page.

**Student 9: Teresa**

*(average reading comprehension, low MARSI, low ORSI, low Internet use)*

Teresa was the most reluctant participant in the think-aloud activity. She spoke very quietly, often covering her mouth with one hand while the other hand operated the computer mouse. During the activity, it was very difficult to hear and understand her speech. Teresa had a bit of difficulty with the anagram practice exercise, but eventually solved it. For the think-aloud activity, Teresa chose Google to search for an article. She cleared the address bar and entered the new address, then typing in the phrase “global warming.” She skimmed through the search results and selected the second item listed, choosing to view information about fossil fuels. She read quietly to herself, still with a hand covering her mouth, and stated “Hmmm ...this is interesting ... I like science a little bit so this is good ...ok ... I’m going to go back now. This is kind-of boring... I’m kind-of bored here.” She returned to the main page she’d selected and clicked on Chemical Equations. After the page loaded she commented “but I’m not good at math, so not that ...,” and returned again to the main page. She selected another topic (biomass burning) and said “oh, this is like forest fires and stuff you see on TV.” She appeared to be losing interest in the activity, and said “ok ... is that all?”

**Student 10: William**

*(high reading comprehension, high MARSI, high ORSI, low Internet use)*

William was very excited to be selected for the think-aloud activity and was very conversational with the researcher on the way to the computer lab. He completed the first practice exercise very quickly but had a lot of trouble with the anagram. Nonetheless, he continued to be quite talkative during the think-aloud activity. He appeared to be comfortable talking to both the researcher and himself as he read through the passages he selected. William surveyed the overall length of the text, scrolling to the bottom of the page and then back to the beginning, commenting that it was quite long. He noticed unusual spellings of words (calling a British spelling a “typo”) and frequently made connections to his prior background knowledge of the subject. William would read sentences and comment on their tone, calling some items “funny” and others “political.” He was very skeptical of the information he read, repeatedly questioning statistics and doubting the validity of the statements. He would ask “Why? Why are they saying that? I don’t know if that’s going to happen ... 30%-40% less [oil consumption] ... I don’t think so. No I don’t think that’s going to happen.” He stated a preference for charts and pictures and other numerical or graphical presentations of information when he’s reading. He chose to use Google to locate his article for the activity, but commenting “I’m not quick on computers ... I don’t have one at my house ... oh, there’s only 23 million to choose from ... um, I’m just going to pick the first one – ooh, it says dangers, ok.” He continued to read quietly to himself and said “Those scientists sound a little crazy ... just trying to get in the news ...” He read through the remainder of the article, stating that he did not know people could die from the heat caused by global warming, and that they should just stay inside out of the heat so they won’t die. He concluded “people need to be careful about what they do.”

### **Student 11: Natalie**

*(high reading comprehension, low MARSII, low ORSI, low Internet use)*

Natalie was completely untroubled during the think-aloud activity. She remained very talkative, somewhat sarcastic, and very relaxed in her body language as she read and participated in the activity. As she would read, she would laughingly say, “Yeah, I don’t know those words ... Yeah, um, I don’t really care anything about this. This isn’t interesting ... it might make more sense if I could see it.” She, too, used Google to locate an article for the activity, and selected the first result “because it said it was news.” The particular article she selected contained information about the shrinking arctic ice cap. While she stated that it “looked interesting because it was about the ice and stuff,” she was skeptical about the facts. “It’s talking about how the ice is melting – that’s nice – I guess I wonder how they really know that ... um, ok ... here it says how they measure it .... Oh, now they’re saying that in 2060 there won’t be any ice. How can they predict that? That cracks me up.” She continued to read quietly without reading aloud, and would interject comments such as “ummm, sorry, I had to re-read that again ... umm, yeah, this is boring ...ummm ...” One item she read was initially confusing, but Natalie made a reference to her own life and quickly understood the new information. She said “That doesn’t make sense” and continued reading quietly, then said “OK – the water reflects the sun’s heat and it doesn’t heat up... that makes sense because it takes our pool forever to heat up in the summer ...” Natalie concluded the section by commenting on how she does not like to read from a computer screen. She stated “it’s just hard for me to read on a

screen .... It's just easier to read on paper. I don't know. Like when I was little I used to have a problem with my eyes and I had to have colored sheets to go on my paper so there wasn't as much contrast. It's just hard to read the screen. That's why I like to read books better."

**Student 12: Ashley**

*(high reading comprehension, high MARSI, low ORSI, low Internet use)*

Ashley was quick to solve the anagram practice exercise, and was very good at speaking her thoughts as she read and quickly creating summaries of the information. She stated "OK- whenever I don't know what something means I just guess ... then I just think about it in my own words so I can retain the information." She easily recognized when she lost focus or concentration, which was quite often during the think-aloud activity. "Umm ... ok ... I wasn't really paying attention there so I have to go back and scan over that stuff again." She attempted to make connections within the text, commenting that she was "trying to think about how this is related to the information up there in those paragraphs before." Ashley chose Google for locating an article for the think-aloud activity, but said "I never pick the first one ... here I want an overview so I'm going to pick Wikipedia." She mentioned that she often had difficulty remembering details, stating "see, the .6 and the .2 – it's hard to retain ... I can't retain that detailed information." Later, when she came to a word that was unfamiliar (anthropogenic), Ashley pronounced the word correctly, but stated that she didn't know what it meant. Within the text, this particular word was hyperlinked to a definition, but Ashley did not



choose to follow the link, and instead guessed that it just had “something to do with the atmosphere.” (In actuality, this word means that the event or situation is one caused by human activity.)

### **Student 13: Olivia**

*(high reading comprehension, low MARSII, high ORSI, low Internet use)*

Olivia was very talkative throughout her think-aloud activity. She was quick to comment that she didn't know some of the information while she was reading or that the information did not make sense to her. Olivia was highly skeptical of the information she read, questioning the statistics and making comments such as “how do they [the scientists] know that's going to happen? That's years from now ...” Later, reading about pollution levels and greenhouse gases, she stated “they're crazy if they think they can fix this... we can't fix it ... we can't take the pollution back out of the air ...” Like many of the other students, Olivia stated her preference for using Google as a search engine. She mentioned that she seldom used the computer, but knew to use Google because “all my teachers tell me to start there.” She typed in her search terms, and selected a page which lists articles from magazines and newspapers. “Hmmm ... these look like headings,” she says, “so I am going to just pick one that looks interesting to me” and selected an article about global warming and coastal fisheries. She scrolled down and then back up the page, looking at the article overall, and began reading at the top of the page. She recognized her insufficient background knowledge “I didn't realize people worried about fishing ... I

guess because I don't live in Florida or somewhere like that." Olivia continued to read quietly, making other comments such as "I wouldn't want a job like that where I had to measure the ocean" and "I guess the fish at risk are the ones people eat" and "I didn't realize this was such a big deal."

### **Conclusion**

This chapter has presented both the quantitative and qualitative findings of the research study, with little analysis or discussion. The research questions are yet to be answered fully and there may be lingering uncertainty about the importance of the findings and what the results truly mean. How do the quantitative findings compare to one another, how are the qualitative findings related to the quantitative ones, and how does the actual strategy use compare to the reported strategy use? These questions will now be discussed in detail in Chapter 5.

**CHAPTER V**  
**ANALYSIS OF THE DATA**

## **Introduction**

The preceding chapters have presented an overview of this study, summarized the relevant literature, detailed the methodology, and presented both the quantitative and qualitative data from the student participants. This chapter will summarize that data and analyze its significance for this population of students and discuss these findings with regard to student strategy use in print and online environments, the role of reading comprehension in these tasks, and the relationship to internet usage. In this chapter, the findings are discussed in relation to the original research questions guiding the study. The quantitative and qualitative findings are integrated in this section of the study to “mix the data” (Creswell, 2003; p. 212) as the data works together to explain and explore the relevancy of the results.

## **Student-Reported Print Reading Strategies**

The first research question formulated for the study seeks to identify the reading strategies students report using while reading print materials, such as textbooks and magazine articles, for informational purposes. To answer this question, a sample of students (n=69) completed the Metacognitive Awareness of Reading Strategies Inventory (MARSI).

Overall, the students in the sample scored in the average range (mean=3.27) of their strategy use with print materials. The data reveals variance in scores based on reading comprehension, but not enough to achieve statistical significance. Other

differences are evident when these scores are separated into the three categories of strategy: problem-solving, support, and global. This sample of students scored highest on their problem solving strategies (mean=4.19), followed by support strategies (mean=3.33) and global strategies (mean=3.23).

The student's high use of problem solving strategies is seen in the four strategies with the highest overall mean scores. These were questions 27 (4.49), 21 (4.32), 16 (4.22), and 11 (4.21). All of these questions address problem-solving strategies:

*Question 27: When the text becomes difficult, I re-read to increase my understanding.*

*Question 21: I try to picture or visualize information to help me remember what I read.*

*Question 16: When the text becomes difficult, I pay closer attention to what I'm reading.*

*Question 11: I try to get back on track when I lose concentration.*

These responses indicate that the students in this sample are skilled problem solvers while reading print materials. All of these skills are indicative of metacognitive processing. Awareness of one's own processing of information, loss of concentration, and a need to better understand the information presented demonstrate the students' control of thinking, and their ability to think about their thinking. Problem-solving is a hallmark of a reader who is highly skilled and metacognitively aware of his/her own mental state while reading and processing information (Pressley & Afflerbach, 1995; Pressley, 2000; Garner, 1987).

The lowest overall mean scores were indicated by questions 24 (2.84), 10 (2.49), 15 (2.46), and 2 (2.21). Question 10 involves the use of a global reading strategy, while the remaining questions address support strategies:

*Question 24: I go back and forth in the text to find relationships among the ideas in it.*

*Question 10: I skim the text first by noting characteristics like length and organization.*

*Question 15: I use reference materials such as dictionaries to help me understand  
what I read.*

*Question 2: I take notes while reading to help me understand what I read.*

These answers indicate students' less frequent use of global and support strategies to increase understanding of print materials. These findings are somewhat inconsistent with the research on reading strategy use and the findings from Mokhtari & Reichard (2002) who, when developing the instrument for use in research, found that there were significant differences in the use of global reading strategies, specifically with regard to reading ability.

Although many studies have compared students' reported print strategies with the actual use of print strategies while reading print texts, in this study the MARSII scores were used for comparative purposes only.

### **Student-Reported Online Reading Strategies**

The second research question was designed to identify the strategies used by high school students while reading online texts. To measure the reported strategy use, the sample of students completed the Online Reading Strategy Inventory (ORSI), a self-report measure that was adapted for use by the researcher.

During the design of the research project, it was hypothesized that readers who were highly strategic when reading print texts would also be highly strategic when

reading online texts. It was also hypothesized that students who spent more time per week online would be more strategic – that is use more strategies more often – than students who spent less time online. Finally, it was hypothesized that students who scored higher on measures of reading comprehension would be more strategic and utilize more strategies while reading online texts.

Overall, the students in this sample scored high on their self-reported use of online strategy, with a mean score of 3.52. As with the use of print strategy, differences between reading comprehension groups was not statistically significant.

The students' highest use of online reading strategies is evident in the highest mean scores for questions 14 (4.10), 16 (4.08), 9 (4.0), and 19 (3.97):

*Question 14: When the online text becomes difficult I pay closer attention.*

*Question 16: I use the pictures and graphics on the sites to help understand what I am reading online.*

*Question 9: I try to get back on track when I lose concentration.*

*Question 19: I visualize or picture in my mind the things I read online.*

Similar to the use of strategy with print texts, most of these strategies (questions 14, 9, and 19) relate to problem-solving strategies.

The lowest mean scores indicate strategies that the students in the sample used very infrequently when reading online texts. These include questions 13 (3.23), 5 (3.07), 21 (2.92), and 2 (2.23):

*Question 13: I use the links to reference material (like online dictionaries) to help me when I don't understand what I am reading.*

*Question 5: I read out loud to myself when the online text gets confusing or difficult to understand.*

*Question 21: I critically analyze and evaluate the information I find in online texts.*

*Question 2: I take notes when reading online to help understand what I read.*

Some of these reports are not consistent with the students' think-aloud protocols, and will be discussed later in this chapter. Three of these four are support strategies (questions 13, 5, and 2) and indicate that the students in this sample do not use available online supports to increase their understanding of the text.

Many of the students (42%) report "always or almost always" printing a copy of their online information. Much of this may have to do with differences in screen resolution versus monitor resolution or color combinations online. This is, however, an interesting finding in light of two comments from students in the think-aloud activity. Amy and Natalie both mentioned a preference for reading from print texts, and discussed their dislike of reading from a computer screen. Amy commented, "I also think sometimes things are easier to read in a book – when it's in a line – you know, the structure of it – oh, what's that called? Parallel? I don't know. I think sometimes it's easier to read a textbook." Natalie stated that her preference was due to problems she'd had with her eyes and the helps that some teachers had provided to her when she was younger. Natalie said that it was "hard to read from a screen. It's easier to read on paper. I don't know. I used to have problems with my eyes. I had to have colored sheets to go on my paper so there wasn't as much contrast." These students' explanations of their



respective reasons for printing a copy of the online text may begin to shed light on the propensity to print when reading information from online texts.

Many of the self-reports provided by the students on the ORSI were inconsistent with their actual use of strategy as evidenced in their think-aloud activity. These will be discussed in the section which compares actual strategy use to the reported strategy use. Overall, the students in this sample reported high use of problem-solving strategies while reading online texts, and reported being more strategic readers of online texts than they are with print texts.

### **Comparison of Strategy Use**

The third research question asked if greater strategy use existed in one format or the other. The original hypothesis was that students who are high strategy users with print texts would also be high strategy users with online texts. The results from this study show that there are differences in strategy use depending upon the types of texts students are using. Overall mean comparison demonstrates that there is a measurable difference in the mean scores of print strategy and online strategy, where students are much more strategic when using online texts. Furthermore, ANOVA testing indicates that this difference is statistically significant. By integrating the data from both the quantitative and qualitative analysis (Creswell, 2003) during this analysis phase, these findings are more illustrative and explanatory than either one could provide individually and are described in detail below.

*Previewing the text (MARS1 4 to ORSI 4)*

The same number of students (n=19) reported that they “always” preview the text or look at the overall length and characteristics, whether they are reading print texts or online texts. Eight of these were the same students who always previewed the text in either format. Although this is a small percentage of this sample of students, it does suggest that there may be a transfer of some strategies from one environment to another. Two of these eight students who reported always previewing the print text and online text participated in the think-aloud activity. Both Erica and Renee self-reported the use of this strategy, but only Renee was observed actually using this particular strategy when she was online, immediately scanning the entirety of the text, scrolling to the bottom of the page and returning to the top before she began reading. Erica began reading at the first sentence, without scrolling through the page, looking at length, or any other overall analysis of the text. Two other students in the think-aloud activity, Olivia and Julie, reported that they always previewed the online text before reading. Olivia did use this strategy while participating in the think-aloud activity, but Julie did not. It should be noted that this also is a key strategy identified by Pressely and Afflerbach (1995) which is categorized in their list of pre-reading behaviors. These results show the difference between the strategy of previewing the text in print and online.

*Use of reference and supplementary materials (MARS1 15 to ORSI 13)*

Pressely & Afflerbach (1995) note that it may become apparent to the reader that he/she cannot figure out the meanings of words or ideas in one text without consulting additional texts (p.41). Students reported using reference materials to help them understand what they were reading with mixed figures, depending on the text environment. With print texts, 14.5% reported that they always used reference materials to aid in their understanding, while online 21.7% reported that they always used reference materials. This could be explained by the ease or convenience with which most online reference materials are accessible through hyperlinks and roll-over features. Additionally, these findings are consistent with research by Poole & Mokhtari (in press) which determined that college students were more likely to use assistive features online, due to the simplicity and expediency of the using such resources.

During the think-aloud activity, many of the students were unfamiliar with some of the vocabulary in their selection. Two students, Michael and Ashley both encountered this situation, and had access to hyperlinked definitions of the unknown terms. While Michael had reported that he “usually” availed himself of these assistive features, and Ashley had reported that she “sometimes” used them, neither of these students clicked the hyperlink to obtain a definition of the unknown word. Ashley’s word, anthropogenic, could have improved her overall understanding of the paragraph, had she clicked the definition. Her “guess” was very inaccurate, and may have increased her confusion. This is consistent with Williams (1993) findings that some readers would generate connections to words that were inaccurate which would then affect hypotheses regarding the meaning of the text which were incorrect and inconsistent with the true meaning. Students in this study used reference and supplementary materials more online than they did in print.

*Use of tables and graphics (MARSII 17 to ORSI 16)*

Students' use of tables, charts, or other graphics to assist in their comprehension of the text varied greatly depending on the text environment. With print texts, only 23% of the students reported always using tables, charts, and other graphics to help them understand the text. Yet when reading online texts, 47% reported always using these features to improve their understanding.

During the think-aloud activity, three of the students, James, Amy, and Samantha, paid careful attention to the graphics on their respective pages, investigating them more fully or reading the text of a table to understand the material. This use of strategy was consistent with their self-reports, as James and Amy had reported that they "always" used pictures and graphics to aid understanding, and Samantha reported that she "usually" used them when reading online. Other students did not attend to these alternate presentations of information. The most interesting discrepancy is the difference between the uses of such figures online versus their use in print. Research has focused on the role and use of graphics, tables, and charts (Reinking, Hays, & McEneaney, 1988; Hays & Reinking, 1991). These studies together found that readers who were given explicit instruction to attend to the graphics for information scored higher on information recall assessments than those who did not.

There may be a need to also cue online readers to attend to information that is presented in tabular or graphical forms to increase recall and comprehension of online texts. While twice as many students reported using this type of information while online, few demonstrated the use of this strategy in the think-aloud activity.

*Use of typographical features (MARSII 22 to ORSI 20)*

Typographical features of text, such as boldface, italics, font size, and color, can all be indicators of key information, and are generally useful in directing the reader's attention. Question 22 on the MARSII and question 20 on the ORSI addressed the use of these typographical features as a strategy used by readers. Online, more students are using typographical cues to identify important information. While 37% of the students report always or almost always using these typographical features with online texts, only 29% report always or almost always using these features with print texts. Because these typographical features may direct the reader to important or key information in the text, both of these figures are very low. This finding is also relevant for web-designers and others involved in the creation and maintenance of online texts. Font and type should be used only to direct users to key information, but even when this is the case, student readers may not take note of these special features. In this study, students reported higher use of typographical features while online.

*Pause and reflect (MARSII 18 to ORSI 17)*

A reader's ability to reflect on the text, the strategies used, background knowledge available for use with the present text, and the overall comprehension of the text are strategies that are key to the use and development of metacognition while reading. While 20% of the students reported always or almost always stopping to reflect on their reading of print texts, only 17% reported always or almost always stopping to reflect on their reading of online texts. Again, both of these figures are quite low. Online texts, because of their hyperlinked nature and the user's need to scroll and move through the text, may

limit the reader's ability to stop and reflect on his/her processing of the text. Pressley & Afflerbach (1995) note this reflection as a "tactic for dealing with difficult texts" (p.37). Natalie was the only student in the think-aloud activity who used this strategy when she became confused about a passage in her online text. After stopping, thinking, and making connections to her real-world experiences that were similar to the information presented in the text, she was able to make sense of the text and continue reading with greater confidence. Because this is additionally one of the key strategies described by Pressley & Afflerbach (1995), the scenario is described in more detail in the section which overlays their conceptual framework onto the think-aloud data. Overall, students in this study reported pausing and reflecting on print texts more than online texts.

### **Student Internet Use**

Perhaps one of the most surprising findings in this particular research study was the low use of the internet by the students in the research sample. Amount of internet use did not have an effect on strategy use. Although it was hypothesized that students who were more frequent users of the internet would be more strategic in their reading of online texts, these results were not found in this study. While the *Teens and Technology* (2005) survey, a part of the Pew Internet and American Life Project, found that 21 million (87%) teens, aged 12-17, report using the Internet and more than half of the respondents reporting that they go online on a daily basis, this study found that 95% of the students reported using the Internet. The majority of the students reported using the Internet less than 10 hours per week, or less than two hours per day.

Nielsen's (2005b) findings were consistent with the mistaken assumption that individuals make with regard to teen internet use. Overwhelmingly he found that students are not as savvy as people think. In their completion of a task designed by Nielsen and his research team, teens had a 55% success rate versus a 66% rate for adults. Nielsen and his colleagues attributed this to lower reading levels, poor search strategy, and overall impatience. This echoes the caution of many other researchers (Kamil & Chou, 2005; Jonassen, 2000; Elshair, 2000; Stimson, 1998; Sutherland-Smith, 2002; Burke, 2002) that clicking and surfing do not equate to reading and that the ability to navigate does not equate to comprehension of meaning.

### **Reading Comprehension**

To test for differences in strategy use by reading comprehension group, a split-plot ANOVA was used, with reading comprehension (3 levels – low, average, high) as the between factor and strategy measures (2 levels – MARSII & ORSI) as the within factor. The results demonstrate that there is only a main effect for the strategy. The lack of a significant interaction between strategy and comprehension indicates that the differences between reading comprehension groups did not affect the use of strategy, either print or online. These findings are somewhat surprising in light of other research and theory.

Neilsen's research (2005a) indicates that reading ability may have significant effects on the types of activities readers engage while using online texts. The findings indicate that less-able readers scan the text more, often miss important information, lose

track of their place online when forced to scroll through text, and often have greater difficulty assessing the content of the site from glancing at the information presented. However, this research was conducted with adult readers. Afflerbach (2000) notes that since the majority of existing protocol analysis in reading research has utilized talented or expert readers (as Nielsen's with hypertexts), existing theory may not be valid in its use with high-school students. While the assumptions guiding the analysis of think-alouds is that less able readers do not provide as detailed verbal reports as better readers, Afflerbach (2000) notes that this assumption may need to be reexamined, and calls for more studies of younger readers to understand the development of strategic reading processes.

The overall differences between the students in the sample, including their reading comprehension scores, may not have been significant enough to affect their use of reading strategy, regardless of the nature of the text. However, two students, Renee and Olivia, reported higher strategy use on the ORSI, used a number of strategies in the think-aloud activity, and had higher reading comprehension scores than some of the other think-aloud participants. Conversely, both Ethan and Samantha reported lower use of strategies on the ORSI, voiced few strategies during the think-aloud activity, and had lower reading comprehension scores. Therefore, the relationship between online strategy use and reading comprehension is one that must be further explored through additional research.



### **Strategy Use Compared to Reported Use**

Van Someren, Barnard, and Sandberg (1994) suggest that the think-aloud be combined with other research strategies, and Pressley and Afflerbach (1995) call for greater validation of the think-aloud reports through their relation to objective measures of performance. Therefore, the think-aloud activity is included in the research design to check the validity and completeness of the reports by students on the amount and types of strategies used while reading online texts. Ericsson & Simon (1993) also note the concerns that some researchers may have with errors in self-reports and the think-aloud methodology, yet they remind that the basis of many daily social interactions is predicated on our trust in the statements of others (p.7). The statements of strategy use on each of the self-report measures reflected few, if any, items which could be perceived as more socially desirable, as each was focused on behaviors central to reading activities, and all were phrased in such a manner that there were no correct or incorrect answers. Nevertheless, Mokhtari and Reichard (2002) do caution that “invoking certain strategies through an inventory... may indicate that the students know about or are aware of those strategies” and that researchers and teachers should remember that “awareness of strategies does not guarantee that students actually use them” (p.255). The following sections provide examples of the use of strategies within Pressley & Afflerbach’s (1995) categories.

### **Pressley & Afflerbach’s (1995) Framework**

The framework provided by Pressley & Afflerbach (1995) can also be used to categorize student statements and activities during the think-aloud procedure. This

framework serves as the a priori set of categories Ericsson & Simon (1993) suggest the researcher use when seeking to classify statements produced during the think-aloud activity. Pressley & Afflerbach (1995) remind that “good readers not only know what they are doing, but why they are doing it, ever aware of the characteristics of text they are confronting and their own reading goals” (p.68). Overall, the students exhibited 9 of the 14 behaviors identified through Pressley & Afflerbach’s research while reading online. It is also important to note that Pressley & Afflerbach (1995) state that “probably no reader does all of the activities” and that it is expected that the level of activity and number of strategies may vary “with the purpose and goal of reading. Indeed some activities preclude others” (p.31).

#### *Reading some sections while ignoring others*

The strategy of skimming through the text can be beneficial or detrimental to readers, depending upon their background knowledge, content expertise, reading goal, and level of comprehension. For expert readers, skipping sections of text which are redundant or unnecessary to the reading goal may have no ill effect on the comprehension of the text as a whole. For less-skilled readers and those with less content expertise, skipping sections of text can lead to confusion and misinterpretation. Pressley & Afflerbach (1995) note that information which is located in many places throughout the text can contribute to the overall meaning (p.54), therefore this strategy of selective reading is not always detrimental.

As Amy read through her passages, she would track her place on screen with the cursor. When she began to lose interest in the passage, she skipped across several

paragraphs of information, and said, “I’m just better with stories and stuff than facts. When it’s just facts, I get bored and start doing this a lot [referring to her intense scrolling] and clicking around and stuff.” Although Amy was an average reader and reported high use of strategy with both print and online texts, she was not a frequent internet user. Her inattention and impatience caused her to skip through large sections of the text, diminishing her ability to focus on the text as a whole.

### *Skimming through the information*

While a few of the students read almost every word of their selected text, scrolling through the text from top to bottom only once, several others mentioned that they were reading more superficially. Erica specifically mentioned skimming, and although she believed that she was not skimming, her statement reflects that the level of attention she paid to the words and her own comprehension could indicate otherwise. Erica described the way that she was reading though the material, that she was “not skimming, but not reading like it was directions or something.” In other words, though Erica thought she was not skimming, she was not devoting much energy to the retention or use of the information. Samantha and Ethan both skimmed through their articles, scrolling and skipping over large sections of text passages. Both of their think-aloud activities were very short, as neither of them spent a great deal of time reading through the text and reporting their thoughts.

*Reading using automatic processes (until a comprehension break-down occurs)*

Pressley & Afflerbach (1995) note that sometimes the reading task is not challenging, and the reader can progress through the text with little difficulty, and “when that is the case, reading simply proceeds along at a rapid pace, and the information processing demand is quite manageable” (p.37). For the majority of the students, this appeared to be their preferred method of interacting with the text. When the information was readily understood, and easy to process, the students’ think-aloud reporting would simply be a restatement of the ideas in the text or a verbatim report of the text. Only when presented with unfamiliar concepts, words, and ideas did the students begin to read more slowly (as evidenced by their cursor tracking) and voice confusion and their need to employ additional strategies such as reading aloud or re-reading to increase their understanding. Julie commented that one paragraph was confusing, and she “really had to focus on the words.”

*Reading aloud to better understand text*

All of the students practiced this strategy to increase their understanding of what they were reading. Many of the participants were very soft-spoken while they read aloud, often simply whispering (sub-vocalizing) the words so that they were scarcely captured by the microphone on the camera. Amy recognized that she was reading aloud, and spoke to the researcher to explain this strategy. She said, “I read out loud a lot – I don’t know – it makes sense if I say it out loud to myself.” Pressley & Afflerbach (1995) note this strategy as one which is widely used to deal with difficult texts. They continue that “although the effects of this tactic are not clear, such reading does force more conscious

attention and slower processing of text than typically occurs during silent reading” (p.37). Amy confirms Pressley & Afflerbach’s (1995) supposition that the act is “reassuring” to the reader (p.37) by noting her preference for utilizing this reading strategy. James and Michael also repeatedly read aloud throughout their think-aloud activity.

Although the students in the think-aloud activity practiced this strategy to assist them when reading online texts, it had one of the lowest overall mean scores on the ORSI. The student’s reported use of this strategy compared to their actual use of this strategy is highly inconsistent. Amy accurately reported that she always used this strategy to assist her understanding when reading online texts. James and Michael had reported that they never or almost never used this strategy when reading online texts, but their actions during the think-aloud demonstrate that they, too, rely heavily on this strategy when reading online texts.

*Repeating or restating text to clarify or commit to working memory AND  
Repeating or restating ideas to clarify or commit to working memory*

Many of the students, when prompted by the researcher to think aloud, would simply restate the information from the last sentence they had been reading. This strategy appeared most often when the students were not encountering difficulty within the text. Many students would also read aloud and restate or repeat the first sentence of a paragraph, possibly in an attempt to focus their own thoughts and provide themselves direction to continue reading. Samantha would begin many of her think-aloud statements by reporting “it says...” and then repeat word for word what the current sentence stated.

Ethan, when prompted to think-aloud would provide a very succinct summary of the information in the sentence he was reading at that time.

### *Pausing and reflecting on the text*

Natalie best demonstrated this strategy when she was able to pause, reflect, and finally make sense of a concept which was initially confusing to her. The text she read stated that the sun did not necessarily increase the speed of melting. She stopped reading aloud, and said “that doesn’t make sense” but continued to read. Then, she paused and began discussing the sun’s effect on her family’s swimming pool, comparing this to the effects of light and heat on large areas of water.

### *Paraphrasing the text*

Amy was concerned about the length of her text and the words she encountered. She commented that although none of the words individually were particularly difficult, “when all these big words are all together it’s confusing.” At one point, she said, “See... ‘Enthusiastic expectations for electric vehicles’ when they could have just said ‘high hopes for electric cars’.” When using online texts, 22% of the students reported that they always or almost always used this strategy to increase their understanding. With print texts, 26% of the students reported paraphrasing the text to increase understanding. Amy is, in this case, an interesting contrast, as she reported that when reading online texts, she never or almost never utilized this particular strategy. Ashley also mentions using this

strategy when she comments “I just think about it in my own words so I can retain the information.”

*Looking for patterns within the text (or making connections within the text)*

Repeated key words and phrases can often provide clues to the reader about the main idea of a passage and help to identify relevant themes within a text. Although 33% of the students overall reported using this strategy with online texts, scrolling to make connections within the text, only 10% reported using this strategy with print texts.

Ashley was the only student who, during the think-aloud activity, looked for connections within the text and attempted to make reference to earlier sections. At one point during her reading, she paused and said, “ok – umm, I was just trying to think about how this relates to the paragraphs above it...” then she continued in silence for a minute before concluding the paragraph and restating the last sentence which provided a summary. Interestingly, Ashley had self-reported on the ORSI that she only occasionally utilized this strategy with online texts.

*Unused strategies from the framework*

During the online think-alouds, none of the students participating exhibited the following behaviors noted by Pressley & Afflerbach (1995): making notes; making predictions; explicitly looking for words, concepts, and ideas within the text; Reading in a linear (front-to-back) fashion; Resetting or re-evaluating goals in accordance with information from the text. Two of these strategies, note-taking and linear reading, are not surprising for they may be somewhat misplaced when reading online texts. Because the

nature of an online text does not encourage linear reading, the strategy of linear reading may actually be ineffective to increasing a student's understanding of the text. Most of the students began scrolling up and down the pages even as they were loading. Note-taking is likely not a widely used strategy while reading online texts, for the ease and convenience of printing often subverts the need to make notes separate from the online text.

### **Other strategies of interest**

There were a number of other strategies used by these students which emerged during the qualitative phase, while the students were involved in the think-aloud activity. Some appear to be unique to the online environment while others are simply interesting behaviors exhibited by this particular group of participants. The following sections provide examples of these additional strategies.

#### *Re-reading*

Although this is not specifically a strategy mentioned by Pressley & Afflerbach (1995) in their list of strategies used during reading, this item was included on the MARSII for use with print texts. From the overall descriptives, 64% of the students reported re-reading information when the text became difficult to understand. While this was not an item included on the ORSI, the figures may have been high as well. Almost all of the students who participated in the think-aloud activity reported re-reading information when they became confused or distracted. Ashley reported that she “wasn’t



paying attention” so she had to “go back and scan over that stuff again.” Amy said that she had “to read things again to make sense,” and Natalie apologized for her lack of focus, stating “sorry, I had to read that again.” After a period of silent reading, Renee said, “um... this is kind-of confusing... but I am just going to read it again.”

### *Critical analysis and evaluation*

Only 26% of the students in the overall sample reported that they usually (4) or always (5) critically analyze the information presented. At a time when information can be created and posted online by anyone anywhere, this statistic seems shockingly low. Why are students not thinking critically about the information that they are finding and using? During the think-aloud activity, several of the students did question the information, and verbalized their skepticism of the data and figures presented in the text. Olivia questioned the statistics, asking “how do they [the scientists] know that’s going to happen? That’s years from now...” Later she said, “Car companies are crazy if they think they can fix the pollution by changing the cars. We can’t fix it. We can’t suck the pollution out of the air.” Natalie doubted the validity of the measurements, stating “I guess I wonder how they really know that... umm; ok... here it says how they measure it.... Oh, now they’re [scientists] saying that in 2060 there won’t be any ice. How can they predict that?” Renee repeatedly made comments about her disbelief of the statements while she was reading. She said “well, on this I think they’re overestimating it – there’s no way they know – I mean – there’s no way we’ll be out [of oil] in 40 years – they can estimate or whatever, but there’s no way they can really know William was very insistent about his disbelief of the statements, and asked “Why? Why are they saying

that? I don't know if that's going to happen... 30%-40% less [oil consumption]... I don't think so. No I don't think that's going to happen." These students questioned the statistics, struggled to reconcile them with their own beliefs, doubted the credibility of the source, and remained skeptical about the findings presented in the texts they selected and read. This strategy is likely the first step in developing the skills of cohesion (McNamara & Shapiro, 2005) and corroboration (Britt & Gabrys, 2001). When information is identified as questionable or possibly incorrect, students may then begin to source-check those facts against other sites and sources of information. While this critical analysis was somewhat encouraging, it is important to note that not all of the students exhibited these behaviors.

*Using the cursor to track words or keep one's place/Highlighting passages with cursor*

The students in this sample exhibited one unexpected strategy during their reading activities. Seven of the thirteen students used the cursor to keep track of their place within the paragraph or sentence. Many of those students would also use the cursor to highlight passages when their think-aloud consisted of repeating or restating the text. They also would highlight sentences or phrases when their think-aloud consisted of restating ideas or paraphrasing ideas within the text. Erica, Renee, Julie, Amy, James, Teresa, and Michael all used this strategy to keep track of their place online and to highlight for themselves important passages to reference when prompted to think-aloud. This may have simply allowed the students to remember where they were in the passage, similar to the way an individual might use his/her hand to keep track on a page of text. It may also

have allowed the students to continue to interact with the mouse and the screen, in subtle ways that did not interfere with their reading tasks.

### *Media connections*

Many of the students in this sample talked about how the texts they were reading reminded them of other media texts, specifically news texts that they might encounter on television or in a newspaper. Natalie selected her site because it said that it was news; the text was presented in a typical two column style, similar to that found in a magazine or newspaper. She read and skimmed to the bottom of the first column, then scrolled back up to the top of the next column to begin reading again. When William read about the oil situation and its relationship to alternative fuel sources, he stated that this information “reminds [him] of the news – talking about China and the Middle East, and importing oil.” When he read this, he also commented on the “political” nature of the situation, again referencing his awareness of other media reports and stories. Ethan’s article reported on several world nations meeting to discuss global warming, and Ethan commented that it “is just pretty much the same thing... chaos with vehicles... it’s just like you hear on the news all the time.” Teresa said “oh, this is like forest fires and stuff you see on TV.” As she was searching for an article, Erica first said, “this reminds me of an actual story that I would pay attention to on the news or in the newspaper.” Then later, contradicting her earlier statements, she said, “I’m not really a news person.” Because the Internet use questionnaire did not specifically address the use of the internet for news, no comparisons can be made to the students’ comments and reported use of the internet for news information. However, these comments seem to demonstrate that these students are

aware of other media outlets which provide “news,” including magazines, newspapers, and television news.

#### *Attention or interest*

Boredom was a very common complaint of the students engaged in the think-aloud activity. Repeatedly the students would comment that the text was boring. Teresa said “this is boring... I’m kind-of bored here.” Amy commented that she becomes “real bored” while reading texts online and either begins looking for videos because “the videos are more interesting” or she begins to scroll and click through the pages randomly. Erica commented that the information started to “drag” and that she felt as if she were “dragging” through the text.

Additionally, many of the students were looking for information that was “interesting” to them in some unspecified way. When skimming through her Google results, Olivia mentioned that she was “trying to find one that’s interesting.” Natalie, after she selected her page based on the news-worthiness of the information, selected a link because “it look[ed] interesting.” Julie did not specify any particular strategy she used when selecting a link from her list of search results (such as reading the summaries or source-checking the URL) but instead commented that she was looking through the results “to see what catches my eye.” Both of these findings are consistent with Nielsen’s (2005b) usability research with teens and their preferences for websites that are not boring, include interesting graphics and had overall visual appeal.

## **Conclusions**

The students involved in this research project reported using more strategies more often when reading online texts than when reading print texts. Their use of the internet or their reading comprehension abilities did not appear to influence their use of strategy. The follow-up think aloud activity reveals that students are indeed active strategy users online. Many of the strategies used are similar to those found in print. In both environments, students focus their attention when their concentration falters, use graphics to assist their understanding, and visualize the material to aid comprehension. Additionally, the students exhibited a number of different strategies while reading online texts, including tracking their place online with the cursor, making connections to other media texts, and searching for items of interest. A discussion of the relevance of these findings and their implications for teaching and practice follows in chapter 6.

**CHAPTER VI**  
**DISCUSSION**

### **Summary of research project**

What strategies do students use while they are reading online texts? Are these the same as with print texts? How are these related? Are students more strategic in one environment or another? Is there any influence of internet use or familiarity? What is the role of reading comprehension? These are the many questions this research project attempts to address.

For this sample of 69 students enrolled at a Career and Technical Educational School, their use of strategy varied depending upon the environment of their text. The students were significantly more strategic while they were reading online texts. However, their overall familiarity with the internet and use of the internet did not significantly affect their use of strategy with online texts. Likewise, the influence of reading comprehension was not significant. The use of reading strategy with print or online texts was not affected by the student's overall reading comprehension ability.

There are many related questions which were not asked or answered in the course of this project. Although the findings in this particular study did not indicate significant differences in reading strategy by group, reading comprehension theory and expert reader theories indicate that strategy use is indeed affected by the reader's overall comprehension abilities. Therefore, more studies are needed to demonstrate this connection reading online texts. A follow-up analysis of reading comprehension that could be explored with the current data and regression analysis is whether reading comprehension or time spent online is a better predictor of success online as measured by the ORSI.

An instrument which has a tested reliability coefficient could potentially strengthen the results of the findings. At the present time, there is not an objective measurement of online reading strategy use that has been validated and field-tested for research purposes. Additionally, there is no measure of online reading comprehension ability, for researchers are still struggling with how to best measure online reading comprehension. The components, processes, and skills are still being validated and discussed by researchers from a number of academic disciplines.

The students' use of critical analysis strategies was perhaps the most encouraging theme to emerge during the qualitative phase of the research. Because critical thinking is a key instructional skill for older adolescents, these students' repeated questioning of statistics, facts, and scientific predictions was evidence of their ability to think critically about the validity of the statements, and reclassify statements of fact more accurately as predictions and educated guesses.

### **Recommendations**

The most curious result of this research project is that the differences in reading comprehension were not statistically significant for the use of reading strategy. Much of the existing theory on comprehension suggests that reading ability has a powerful impact on the levels and amount of strategy that a reader is able to employ. One item that may assist in future replications of this project would be the administration of a reading comprehension test at the same time as the other assessments and questionnaires. A



researcher administered assessment may lessen the influence of confounding sources of variance in the results.

Including more participants in the study could improve the generalizability of the findings. From these results, it is not completely clear what can be generalized from this sample to the population of students enrolled in other programs at the Career and Technical Education School, or even teenagers as a whole. This problem is very evident in the discrepancies between the students reported use of strategy and their actual use of strategy as demonstrated in the think-aloud activity. More students participating in both the quantitative and qualitative phases of the research study could assist the researcher in interpreting the results more fully.

It is also imperative that the students in the think-aloud be given more practice voicing their thoughts and thinking out loud while they are engaged in problem solving activities. While in this study the researcher attempted to compensate for this by providing a number of practice activities, it may be helpful to the students to have repeated practice over a longer time period to become more proficient in the think-aloud.

Additional information and more in-depth information about the students as readers may provide other insights which explain their use of strategy while reading both print and online texts. A longer period of research, semi-structured interviews, and other qualitative analyses may also assist in explaining the students' use of strategy with both print and online texts, and how these differ from self-reports.

### **Implications for research, teaching, and service**

The combination of qualitative and quantitative research strategies within this particular study provided ample room for comparison between types of strategies and allowed for a closer investigation of how student self-reports varied from their actual use of strategy when engaged in an online task. Mixed methods research is capable of explaining both the broad and narrow picture of what is happening within a set of research data. In this study, the measures working together provided a more complete understanding of the findings than either one of the measures alone could offer.

Think-aloud research can and should be conducted with students. The expert research base that exists is beneficial, but the development of processes and skill is best understood with younger users and non-experts. When we are fully aware of the errors in students' strategy use, we can then begin to teach them how to understand complex reading strategies, implement them when necessary, and develop processes for improved comprehension and learning.

Teaching reading strategies and developing the use of metacognition in reading texts both print and online are necessary components of reading instruction. Although teachers are often trained in how to teach students some reading strategies, many do not understand the underlying role of metacognition, and few know how to teach students to be metacognitively aware of their abilities as readers. These critical skills of metacognition, including reflection and implementation of strategy, can help students become not only better readers, but also better thinkers and learners.

This study indicates that students have a very incomplete set of skills and strategies in their arsenal of tools when engaged with online texts. Students may be in

need of direct and explicit monitoring and self-regulatory strategies and skills for improving their comprehension and retention of information when reading online texts. Students can be taught that some of the strategies that have been proven most effective with print texts can be applied to online texts, while others may not be necessary. Additionally, there are other key skills and strategies which will afford greater success online.

Classroom teachers who are less familiar with instruction in strategy use may have difficulty providing instruction in either environment. There may be a need for researchers in the area of online strategy to provide consultation or professional development to these individuals. Universities must realize the importance of online texts in schools and in the lives of students and work to ensure that new teachers will be able to support the reading development of students in the online environment.

### **Conclusions**

Many questions surrounding the use of online reading strategies are still far from being answered. While this particular study indicates that students use a number of strategies transferred from print texts, there are also a number of other strategies which are necessary for success with online texts. Additionally, there is a distinct difference between what students report they are capable of doing online, and what they actually do when they read online texts. Several authors (Dail, 2004; McEneaney, 2003; Leu & Reinking, 1996) have indicated that there is a need to provide students with instruction for strategically reading online texts. This is a valid suggestion, yet researchers are still

determining which strategies need to be taught, and how these can best be taught.

Additionally, whether reading comprehension ability or time online contributes to the success of online reading is still unclear.

The students in this research project reported being very strategic readers of online texts, and their think-aloud protocols suggested that several of them were able to accurately self-report on their use of strategy. They were able to use additional sources of online information and assistance, critically analyze and question the text, apply prior knowledge and establish textual coherence within the online text. While others may have overestimated their use of strategy online, or reported uses of strategy in which they did not actually engage, these students were able to provide evidence of some strategy while reading online texts.

This particular study is unusual in that it was conducted with high-school aged students, rather than undergraduate or graduate university students, or individuals who are experts in their research field. Additionally, this project utilized documents and websites readily available on the web, rather than artificially structured documents and web pages for the students to use.

Other researchers and classroom practitioners especially, should continue to use the self-report measures in conjunction with think-aloud protocols to have a combined inventory of student strategy use. If planned instruction for online reading strategies is incorporated into an existing curriculum of study, these measures could also be administered longitudinally, at the beginning, mid-point, and end of a semester to measure the effects of instruction. Changes in reporting, especially in the think-aloud protocols may demonstrate the growth of a reader and his/her development of online

reading strategies. Armed with this knowledge of readers and their development of online reading strategy, teachers and researchers can make more effective use of online texts to promote student learning.

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## Appendix A

### Metacognitive Awareness of Reading Strategies Inventory (MARSI) *By Mokhtari and Reichard c. 2002*

Directions: Listed below are statements about what people do when they read **academic or school-related materials** such as textbooks or library books. Five numbers follow each statement (1,2,3,4,5) and each number means the following:

- '1' means "I **never** or **almost never** do this"
- '2' means "I do this only **occasionally**"
- '3' means "I do this **sometimes**" (about 50% of the time)
- '4' means "I **usually** do this"
- '5' means "I **always** or **almost always** do this"

After reading each statement, circle the number that applies to you, using the scale provided. Please note that there are **no right or wrong answers** to the statements on this inventory.

I have a purpose in mind when I read.	1	2	3	4	5
I take notes while reading to help me understand what I read.	1	2	3	4	5
I think about what I know to help me understand what I read.	1	2	3	4	5
I preview the text to see what it's about before reading it.	1	2	3	4	5
When the text becomes difficult, I read aloud to help me understand what I read.	1	2	3	4	5
I summarize what I read to reflect on important information.	1	2	3	4	5
I think about whether the content of the text fits my reading purpose.	1	2	3	4	5
I read slowly but carefully to be sure I understand what I am reading.	1	2	3	4	5
I discuss what I read with others to check my understanding.	1	2	3	4	5
I skim the text first by noting characteristics like length and organization.	1	2	3	4	5
I try to get back on track when I lose concentration.	1	2	3	4	5
I underline or circle information in the text to help me remember it.	1	2	3	4	5
I adjust my reading speed according to what I'm reading.	1	2	3	4	5
I decide what to read closely and what to ignore.	1	2	3	4	5

I use reference materials such as dictionaries to help me understand what I read.	1	2	3	4	5
When the text becomes difficult, I pay closer attention to what I'm reading.	1	2	3	4	5
I use tables, figures, and pictures in the text to increase my understanding.	1	2	3	4	5
I stop from time to time and think about what I'm reading.	1	2	3	4	5
I use context clues to help me better understand what I'm reading.	1	2	3	4	5
I paraphrase (restate ideas in my own words) to better understand what I read.	1	2	3	4	5
I try to picture or visualize information to help me remember what I read.	1	2	3	4	5
I use typographical aids like boldface and italics to identify key information.	1	2	3	4	5
I critically analyze and evaluate the information presented in the text.	1	2	3	4	5
I go back and forth in the text to find relationships among the ideas in it.	1	2	3	4	5
I check my understanding when I come across conflicting information.	1	2	3	4	5
I try to guess what the material is about when I read.	1	2	3	4	5
When the text becomes difficult, I re-read to increase my understanding.	1	2	3	4	5
I ask myself questions I like to have answered in the text.	1	2	3	4	5
I check to see if my guesses about the text are right or wrong.	1	2	3	4	5
I try to guess the meaning of unknown words or phrases.	1	2	3	4	5

## Appendix B

### Online Reading Strategy Inventory (ORSI)

*Adapted from Anderson's 2002 "Online Survey of Reading Strategies"*

*By Angel D. Kymes, 2006*

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The purpose of this inventory is to collect information about the strategies you generally use while reading online (surfing the Internet, doing research for class, etc.). Each statement is followed by a group of numbers, and each number means the following:

‘1’ means “I **never** or **almost never** do this” while reading online

‘2’ means “I do this only **occasionally**” while reading online

‘3’ means “I do this **sometimes**” while reading online

‘4’ means “I **usually** do this” while reading online

‘5’ means “I **always** or **almost always** do this” while reading online

I have a purpose in mind when I read online.	1	2	3	4	5
I take notes while reading online to help understand what I read.	1	2	3	4	5
I think about what I already know to help me understand what I am reading online.	1	2	3	4	5
I look at the overall view of the text before I start reading online	1	2	3	4	5
I read out loud to myself when the online text gets confusing or difficult to understand.	1	2	3	4	5
I think about whether the online text fits with my purpose for reading.	1	2	3	4	5
I read slowly and carefully to understand what I am reading online.	1	2	3	4	5
I review the online text, looking at length and organization.	1	2	3	4	5
I try to get back on track when I lose concentration.	1	2	3	4	5
I print a copy of the online text so I can write on it and make notes	1	2	3	4	5
I adjust my reading speed according to what I am reading online.	1	2	3	4	5
When reading online, I decide what to read carefully and what I can choose to ignore.	1	2	3	4	5
I use the links to reference materials (like online dictionaries) to help me when I don't understand what I am reading.	1	2	3	4	5
When the online text becomes difficult, I pay closer attention.	1	2	3	4	5
I read information on the Internet for school purposes.	1	2	3	4	5

I use the pictures and other graphics on the sites to help understand what I am reading online.	1	2	3	4	5
I stop occasionally and think about what I am reading online.	1	2	3	4	5
I paraphrase (say in my own words) what I read online.	1	2	3	4	5
I visualize or picture in my mind the things I read online.	1	2	3	4	5
I use the typographical features of the text (bold, italics, headings, colors, and fonts) to identify important information.	1	2	3	4	5
I critically analyze and evaluate the information I find in online texts.	1	2	3	4	5
I scroll up and down in the online text to remember and connect information together.	1	2	3	4	5
I check to see if I understand when I read new information.	1	2	3	4	5

## Appendix C

### Internet Use Survey

*This survey is designed to answer basic questions about your use of the Internet.*

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- ‘1’ means “I **never** or **almost never** do this”  
 ‘2’ means “I do this only **occasionally**”  
 ‘3’ means “I do this **sometimes**”  
 ‘4’ means “I **usually** do this”  
 ‘5’ means “I **always** or **almost always** do this”

I use the Internet at home	1	2	3	4	5
I use the Internet at school	1	2	3	4	5
I use the Internet in other places (parents’ office; library; friends’ homes)	1	2	3	4	5
I use the Internet for sending and receiving e-mail	1	2	3	4	5
I use the Internet for IM & chat	1	2	3	4	5
I use the Internet for school research	1	2	3	4	5
I use the Internet for entertainment	1	2	3	4	5
I use search engines to find information I need	1	2	3	4	5
I rely on friends to tell me about important websites	1	2	3	4	5
I use websites provided by teachers or librarians at school	1	2	3	4	5
I can generally find what I am looking for online	1	2	3	4	5
I often give up because I can’t find what I need on the Internet	1	2	3	4	5
I generally get online, find what I need, and get off to do other things	1	2	3	4	5
I tend to “get lost” online and spend a lot of time doing things I hadn’t planned	1	2	3	4	5
Everything I need for school research is online	1	2	3	4	5

In an average week, I am online:

1-3 hours      4-6 hours      7-10 hours      11-15 hours      16 or more hours

My overall average in school is:

A                      B                      C                      D                      F



## **Appendix D**

### **Directions for Think-Aloud Activity**

Now that we've practiced some think-aloud activities, you have had a chance to see what it means to "think out loud." Your job now is to locate and read an informational article about alternative fuel sources. Please read the article carefully as you would for a class at school. Report your thoughts at any time during the reading. Tell me what you are thinking as it is going through your mind. You can report any navigational problems and any thoughts that you are having while you're reading. If you do not think-aloud, I will remind you to do this. You do not have to summarize or tell me what you've learned about the information until the end of the activity. Just read and tell me what you're thinking. This task should take you about 30 minutes.

## Appendix E - IRB Approval

### Oklahoma State University Institutional Review Board

Date: Friday, May 05, 2006  
IRB Application No: ED06131  
Proposal Title: Identification and Analysis of Online Reading Strategies

Reviewed and Processed as: Expedited (Spec Pop)

**Status Recommended by Reviewer(s): Approved Protocol Expires: 5/4/2007**

Principal Investigator(s)

Angel Kymès	Susan Stansberry
5801 S. 283rd E. Ave	252 Willard
Broken Arrow, OK 74014	Stillwater, OK 74078

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The IRB application referenced above has been approved. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

☒ The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval.
2. Submit a request for continuation if the study extends beyond the approval period of one calendar year. This continuation must receive IRB review and approval before the research can continue.
3. Report any adverse events to the IRB Chair promptly. Adverse events are those which are unanticipated and impact the subjects during the course of this research; and
4. Notify the IRB office in writing when your research project is complete.

Please note that approved protocols are subject to monitoring by the IRB and that the IRB office has the authority to inspect research records associated with this protocol at any time. If you have questions about the IRB procedures or need any assistance from the Board, please contact Beth McTernan in 415 Whitehurst (phone: 405-744-5700, beth.mcternan@okstate.edu).

Sincerely,



Sue C. Jacobs, Chair  
Institutional Review Board

## VITA

Angel D. Kymes

Candidate for the Degree of

Doctor of Philosophy

Thesis: INVESTIGATION AND ANALYSIS OF ONLINE READING STRATEGIES

Major Field: Education

Biographical:

### Education:

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American Library Association

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Date of Degree: May, 2007

Institution: Oklahoma State University

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Title of Study: INVESTIGATION AND ANALYSIS OF ONLINE READING STRATEGIES

Pages in Study: 145

Candidate for the Degree of Doctor of Philosophy

Major Field: Education

Scope and Method of Study:

This study represents a two-part, sequential order mixed-methods project which identified and comparatively analyzed the reading strategies of high school seniors. In order to determine the use of online reading strategies, students were surveyed regarding their use of online reading strategies, print reading strategies, and internet use habits. Standardized reading comprehension scores were also used in the analysis. It was hypothesized that readers who were highly strategic when reading print texts would also be highly strategic when reading online texts and that students who spent more time per week online and who scored higher on measures of reading comprehension would be more strategic and utilize more strategies while reading online texts. A subset of students was selected to participate in think-aloud protocols, giving voice to both strategy and thought as they navigated and read online texts. These verbal reports were qualitatively analyzed and compared to the framework of 'during reading' strategies identified by Pressley & Afflerbach (1995).

Findings and Conclusions:

Data indicated that students were more strategic readers of online texts than print texts, and the difference in strategy use was statistically significant. However, with this set of student participants, neither reading comprehension nor internet use affected strategy use with online texts. Students used a number of the strategies included in the framework, which indicated that many of the strategies from print texts can also be useful with online texts. However, students used many strategies that were unique to online texts and indicate differences in the environments that affect reading, including tracking their place online with the cursor, making connections to other media texts, and searching for items which caught their attention and interest. The think-aloud data also demonstrated that students were inconsistent in their ability to self-report on strategy use. Overall, this study indicates that students have a very incomplete set of skills and strategies in their arsenal of tools when engaged with online texts. Students may be in need of direct and explicit monitoring and self-regulatory strategies and skills for improving their comprehension and retention of information when reading online texts.

ADVISER'S APPROVAL: Susan L. Stansberry, Ed.D.